



FRIDAY, AUGUST 2.

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Contributions.

The Export Rate Decision.

TO THE EDITOR OF THE RAILROAD GAZETTE:

On the whole, I think you are right in your comment on the case of the Produce Exchange, just decided by the Interstate Commission, but I do not believe that we are going to suffer much from the decision as yet. How are you going to judge of the effect of such a decision any way? It is exceedingly hard to do it.

One point you omit. The case of the Boston exporters, who get five cents less than the domestic rate, you do not speak of. For good reasons a difference is made at Boston; now, why for good reasons should not a difference be made at New York? The two cases are not exactly parallel, because the difference at the two ports would be made for different reasons. The Boston case is so arranged, not because exporting in general would stop, but because it would be transferred from Boston to, say, New York. But the New York case is not whether the exporting would go to some other port, but whether export trade as a whole would receive a severe check if inland rates were in all cases held the same. Clearly this is a different question. So I think we should apply the Boston case to the Produce Exchange case with some limitations. Nevertheless, the case does apply, and shows conclusively that if the necessity was clearly manifest, a difference between domestic and export rail rates could be made, and that in a way to work no demoralization.

I wish that the dignity of his court had allowed Commissioner Schoonmaker to say bluntly that he thought as things were now that his decision was the best possible; but that the case was always open for a re-hearing should circumstances in the future point out clearly that some modification would be beneficial to the public at large. That would be my private opinion (thus publicly expressed) of the situation.

JUDEX.

The Cure for Hot Boxes.

The Lake Shore & Michigan Southern
Railway Co.,
CLEVELAND, O., July 30, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Having read in the *Railroad Gazette* several letters and editorials on the subject of the proper lubrication of car journals, I wish to say that there has been a device experimented with under a passenger coach running between Norwalk and Toledo, on this road, that has shown some excellent results, the box not having been warm since it was put in. The device consists of an oil cup placed in the journal box, and feeding the oil to the journal through a wick, the wick being adjusted to touch the journal by a winding-up arrangement, similar to that of an ordinary kerosene lamp. The wick is securely fastened in position after being adjusted.

The cup was put into the oil box May 12, 1888, and has run successfully up to the present time. Its record shows 6,264 miles run to a quart of oil. Unfortunately for the purposes of an accurate record, the brass that was put in was one that had been used before, it having been put under the car new Jan. 11, 1888. It was put into this box June 5, the same year. The brass was taken out and weighed March 17, this year, and weighed 8 lbs. 13 oz. When put in new it weighed 9½ lbs., showing a loss of 1½ oz. since it was put in. This gives 3,555 miles to 1 oz. of brass. The oil used was the ordinary black oil, costing 9 cents per gallon. The journal was measured at the same time that the brass was weighed, and showed a wear of ⅓ of an inch. It had made a large mileage before the new device was put in, therefore we cannot compare the amount of wear with that previous to the introduction of the new device.

This device can be used with the M. C. B. standard box. No attempt has been made in the experiments to exclude the dust, the ordinary wooden dust guard being used.

T. F., JR.

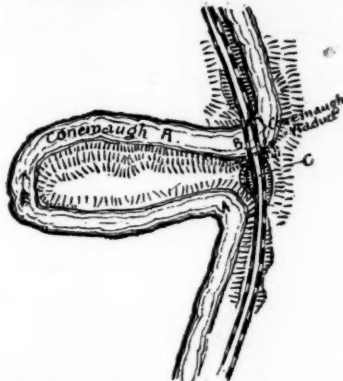
Height of the Conemaugh Flood.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your paper of the 28th ult. I notice it is asserted that at the Conemaugh viaduct, where the "bridge" was 80 ft. high, the water came up level with the top."

If I am not very much out in my diagnosis of the situation there, as seen from the train in going and coming lately, this is calculated to give a false impression. The surprising thing in the whole Conemaugh flood as judged by the signs left behind is the small height of the water. I estimated by eye that the water rose nowhere more than 30 ft. above the bed of the stream, and where the valley was at all widened out the flood did not appear to have been over 20 ft. deep. I hope the engineers of the Pennsylvania road who are now at work in the valley will give some figures on this point, supplementing the report of the American Society's committee.

The situation at the point referred to was as shown by my sketch. The railroad at A was perhaps 25 ft. above the



stream bed, while at B, owing to the rapid fall and long bend of the stream, the track was, as stated, 80 ft., or apparently that, above the stream. The flood reaching A was high enough to pass through the cut at C and descend in a cataract into the river bed at B, completely denuding the bed rock of the bank and carrying away the bridge. Unless I am mistaken in the above estimate of heights and mode of action of the river, it is a mistake, therefore, to say that the river came up level with the top of an 80-ft. bridge.

As I said above, the height of the water in the stream seems to have been surprisingly small for the destruction effected. The latter seems attributable to the velocity with which an immense mass of drift and gravel was swept through the stream bed, denuding the banks up to the level of the flood of every sign of vegetation, but leaving the well-wooded shores above the denuded swath perfectly intact and free from flood trash, which would have been sure to have stuck on the trees and bushes.

On the Juanita, on the other hand, the evidences of extraordinarily high water are plain, if in no other way, in the sweeping of three or four spans together of double track bridges, whose lower chords were 20 to 30 ft., if not more, above the stream, bodily off the piers at three successive crossings. From appearances, however, I take it that most of the spans were dropped by drift striking the lower chords, and the bridges in falling were carried by the flood to their present positions 100 ft. or so below the piers.

W. HOWARD WHITE.

Wheel Tread and Rail Head.

Chicago, Milwaukee & St. Paul Railway Co.,
MILWAUKEE, July 29, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to your issue of the 19th inst., it would appear that Professor Merriman has misunderstood, in part at least, the purpose of the improved wheel tread designed by Mr. Barr, and in use with great success upon this road. Its purpose was, it is true, the "distribution of the pressure over as large an area as practicable," and the means taken to accomplish this end were not only those recommended as desirable by the committee of the American Society of Civil Engineers, but closely in accordance with every-day practical conditions.

It is a fact, patent to every observant railroad man, that the increasingly great weights of modern locomotives and rolling stock are hastening the period of destruction of both wheels and rails from abrasion and flowage of metal. Mr. D. J. Whittemore has made the strongest kind of exposition of this fact in a paper presented lately to the society. The remedy he proposes (flat-top rails and cylindrical wheels) is now, I believe, under discussion. Mr. Barr, taking the rail-head as he found it, has endeavored to supply the remedy in the wheel tread.

Assuming that the rail top for a breadth of 2 in. is struck with a curve of 10 in. radius, this, then, is the maximum surface which could be utilized as contact area, according to our theory, without causing an abnormal amount of sliding friction. The central portion of Mr. Barr's tread is struck with this radius for a distance of 1½ in., and constitutes the rolling contact surface under normal conditions. But, it will be observed, there is no coning to the tread, and it is believed that an equivalent is needed to prevent sharp flanges by the tendency present in nearly all trucks to run to one side from lack of alignment, etc., and also to steady the motion due to lateral play. This substitute is provided by the fillet of large radius (1½ in.) in throat. This portion is not designed for normal contact surface, as Professor Merriman probably assumes, and has no analogy to

the Lehigh Valley rail section, designed to fit the M. C. B. standard throat radius of ⅝ in. Mr. Barr, in fact, has worked upon the opposite theory, providing corner curves of widely dissimilar radii, with the very object of reducing the contact surface at a point where sliding friction would be produced.

My observation, based upon a considerable number of careful measurements of rails and wheel contours under a great range of mileage service, leads me to believe that at quite an early period of their lives both are worn to a more or less perfect top contact fit with a compromise radius, which for our road appears to be about 12 in. This fit has been accomplished by the perfectly natural process of abrasion and "flowage." Why not avoid this punishment by accepting the inevitable in the beginning?

G. W. GIBBS, Mechanical Engineer.

Consolidation Locomotive, Class E-6, Baltimore & Ohio Railroad.

In a later issue will be shown the boiler and certain details of the Baltimore & Ohio Consolidation 20×26 in. engine, a general elevation of which appears in this issue. The locomotive is one of the heaviest of its class, and has some peculiarities of interest.

Among the noticeable features about this design are the following: The short pilot braced to the front truck equalizer fulcrum; the ponderous front drawhead adapted to receive links at various distances above the rail; the large number of bolts securing the cylinders to the smoke-arch; the relief cocks and connections to the back of the steam-chest arranged to be operated from the cab when descending grades; the looseness of the joint between the steam-chest casing and top, which is hardly satisfactory, as it rather interferes with the insulation of the chest from the cold air. The ventilating holes in the base of the sand-box are somewhat of an innovation. The frame lower rails are light and are all made separate. This is unusual, and is not in accordance with the general practice. It has the advantage of allowing the rails to be easily replaced when broken. The bolts securing the eccentric rods to the eccentric straps are shown with only one nut, but undoubtedly in the actual locomotive they are furnished with two as usual. The use of four bolts to secure the equalizer fulcrums to the frame top rails is a very commendable feature. There is often trouble with but two from their getting loose.

There is used in this design a waist sheet attached to the boiler and frames between the second and third pair of drivers. This is now considered by many designers as unnecessary, but it adds to the lateral stiffness of the frames. The boiler of this locomotive is worthy of study, as it is in many respects different from and an improvement upon the ordinary form. As we have said, it will be shown in a later issue. The following are extracts from the specifications of this locomotive, together with a few general dimensions.

SPECIFICATION.

Cylinders, 20 in. diameter and 26 in. stroke; driving wheels, 50 in. diameter.

Fuel, bituminous coal.

Total wheel base, 23 ft. 2 in.; driving wheel base, 5 ft. 2 in.

Total wheel base of engine and tender, 48 ft. 7¼ in.

Total weight, in working order, 124,300 lbs.; on drivers, 112,900 lbs.; total weight of tender, with fuel and water, about 62,000 lbs.

Boiler.

Best quality homogeneous steel, including smoke-box sheet as per specification, cylinder part, ⅝ in. thick; throat sheet, ¾ in. thick. Outside diameter of cylinder part at smoke-box end, 55 in., built with 7-in. wagon top.

Dome, 30 in. outside diameter, double riveted to boiler with ¾ in. rivets, and strengthened at base with 1 in. by 4 in. reinforcing ring. Horizontal seams strengthened with ¾-in. welt strips.

Tubes of lap-welded wrought iron, as per specification, with copper ferrules on fire-box ends. No. 12 B. W. Gauge, 198 in. number, 2¼ in. outside diameter and 13 ft. 8 in. long outside of tube sheets. Tubes to be shouldered down to fit in 2¼-in. holes in back tube sheets.

Fire-box of best quality homogeneous steel as per specification; dimensions inside, 120 in. long, 34½ in. wide at bottom, 45½ in. wide at crown sheet, 79½ in. high in front, 51½ in. high at back. Side and back sheets 5-16 in. thick, crown sheet ¾ in. thick, tube sheets, 7-16 in. thick.

Water space, 3 in. side, 3 in. back and 4 in. front. Stay bolts of iron, as per specification, ¾ in. diameter, 12 threads per in., screwed through and riveted to sheets and spaced not over 4 in. centre to centre.

Crown sheets, supported by 21 crown bars made from two pieces ¾ in. by 5 in., and set 1¼ in. above crown sheet with cast-iron washers. Crown bar bolts, 210 in number, 1 in. in diameter, with button-heads next to fire, fitted in reamed holes in sheet. Crown bars to have 4 sling stays at each bar, connected to shell of boiler and dome.

The holes in the sheets to be slightly countersunk under the rivet heads. All holes in the various plates and angle irons must be perfectly fair with one another and must be completely filled by the rivets. The edges of all sheets must be planed and beveled by machine and care taken that the plates are brought well together before riveting.

Caulking must be done with a round-nosed tool, and great care exercised to avoid grooving the lower sheets.

Working pressure 150 lbs. per sq. in. Boiler must be tested with hot water, 185 lbs. to the sq. in.

Cleaning plugs, six in number, to be placed as shown on drawing, and blow-off cock in side or back. Boiler must be built in strict accordance with drawing.

Grates of cast iron, rocking grates.

Ashpan to be substantially made, with front and back dampers operated from foot plate.

Balanced throttle of cast iron, dry pipe wrought iron lap, welded 6½ in. inside.

Stack, 17¼ in. inside diameter, straight pattern.

Smoke-box, 55 in. outside diam. Extension front, 36 in. long, fitted with spark-arrester, as per drawing.

Arch brick, as per detail drawing.

Frames of the best quality hammered iron. Pedestals must be made out of solid slab or by method approved of by the B. & O. R. R. Co.

Cylinders of close grained best quality iron, planed, fitted and bolted together in a good, substantial manner. Cylinders oiled from cab by Detroit sight feed lubricator, connected to steam-chests by solid drawn copper pipes proved to 200 lbs. pressure.

Pistons of cast iron, with follower plate, cast-iron steam packing. Piston rods of steel 3¼ in. diam.

Guides of cast iron, Laird pattern.

Crossheads of cast steel, wearing surface of cast iron, babbitted.

Valves, Richardson's balance; ¾ in. outside, 1-32 in. inside lap.

Valve motion, shifting link, graduated to cut off equally at all

points of stroke, made of best hammered iron, case-hardened and bushed as shown.

Lifting shaft, made with arms welded on.

Rocker of cast iron, bearing $4\frac{1}{4}$ in. diam., $13\frac{3}{4}$ in. long.

Valve yoke of the best hammered wrought iron, forged in a workmanlike manner. No jumping on of stem will be permitted.

Driving wheels, centres of cast iron, 8 in. number, rim turned, with taper $\frac{1}{2}$ in 12.

Tires of cast steel, as per specification, 4 flanged, $5\frac{1}{2}$ in. wide; 4 plain, $7\frac{1}{2}$ in. wide; 50 in. outside diam., bored taper $\frac{1}{2}$ in 12. Standard gauges will be furnished by the B. & O. R.R. for boring tires.

Axles of the best hammered iron, with journals $7\frac{1}{2}$ in. diam., 8 in. long.

Crank pins of the best hammered iron.

Driving boxes of solid brass.

Connecting rods of best hammered iron.

Engine to be equipped with American steam driver brake.

Two Mack's No. 10 injectors, supplied with intermediate check valves and connected to boiler with $2\frac{3}{4}$ in. solid drawn copper pipe.

Boiler must be lagged with wood and jacketed with Russia iron of the best quality. Cylinders lagged with wood and neatly cased with Russia iron. Cylinder head casings of cast iron, painted, and inside turned to fit cylinder heads. Steam-chest casing of cast iron painted. Dome lagged with wood, with wrought iron painted casing or body, and cast iron top and bottom rings. Hand rails of iron. All castings which are conspicuous on outside of engine, such as dome, sand-box and cylinder casings, to be cast as smooth as possible, facing suitable to such work to be used in moulding, all rough projections removed and otherwise made smooth before painting. Forgings to be neatly made, all sharp corners removed and rounded over wherever practicable, and finished in a good and workmanlike manner. Engine and tender painted black, with small stripes and well varnished. Design for numbers and lettering to be furnished.

Engine Truck.

Two-wheeled swinging centre; wheels, 31 in. diameter, cast iron centres, steel tires $2\frac{1}{2}$ in. thick, $5\frac{1}{2}$ in. wide, as per specification. Gauges will be furnished for boring tires. Axles of the best quality hammered iron. Journals $5 \times 8\frac{3}{4}$ in., springs of cast steel tempered in oil.

All principal parts of engine to be accurately fitted to gauges and templates, and made thoroughly interchangeable. All finished movable nuts and wearing surfaces case-hardened where practicable. United States standard threads to be used on all bolts and nuts. Stay bolts 12 threads per inch. For brass fittings screwed into boiler, mud plugs, etc., standard pipe threads and taper to be used.

Engine to be provided with relief cocks, placed in back of steam-chests, and arranged with rigging to operate them from cab.

Tender.

Tank to be strongly put together and well braced. Top and sides of 3-16 in. iron, bottom $\frac{1}{4}$ -in. iron, riveted with $\frac{1}{2}$ -in. rivets, 16-in. pitch. Capacity, 3,000 U. S. gallons. Tender frame substantially built of oak.

Two four-wheeled centre-bearing trucks, with 33-in. cast iron chilled wheels; wheels to weigh not less than 580 lbs. each and to have B. & O. standard flange.

Tender to be furnished with hand and Westinghouse automatic brakes, applied to both trucks.

Axles of best hammered iron, M. C. B. standard; journals, $3\frac{3}{4} \times 7$. To be made as per specification. Springs of cast steel.

Specification for Stay Bolt Iron.

The iron when broken must show a tough, fibrous grain, free from bright, crystal-like surfaces or points. The tensile strength must not be less than 48,000 lbs., nor more than 60,000 lbs. per square inch. The elongation must not be less than 20 per cent. in a specimen 2 in. long and must be taken at a point of failure to bear ultimate load. The iron must stand being bent cold 180 deg. and hammered down without fracture, and must stand riveting over after it is screwed into the boiler sheets, without cracking or becoming brittle. The following test will also be required: A piece of the iron about 20 in. in length is to have one end firmly fastened in a vise; over the other end a piece of pipe is to be passed to within 6 in. of the vise; by means of the pipe the sample must be bent until the end is at right angles to the portion in the vise, and then bent back to its original position; the iron must be bent not less than twelve times without showing fracture, the bending being each time in the opposite direction to that previous.

Specification for Boiler Tubes.

Tubes must be of tough, even grain, lap-welded, uniform in thickness and quality. A careful examination will be made of each tube, and those which are defective will not be accepted. Tubes must stand expanding and bending cold, without cracking or becoming brittle; scarring of ends hot, without flakes or seams, and must be easily welded.

Specification for Wrought Iron Bars.

Round, square or rectangular iron bars must be fibrous and tough, even grained, good neutral iron, uniform in quality, and should have a tensile strength of 52,000 lbs. per square inch, and an elongation of 20 per cent. If the tensile strength of the iron is less than 48,000 lbs. per square inch it will be rejected. The bars must stand being bent cold 180 deg. without fracture.

Specification for Standard M. C. B. Wrought Iron Axle.

Journal $3\frac{3}{4}$ in. \times 7 in., $4\frac{1}{4}$ in. centre. All axles ordered will be subject to the following requirements. 101 axles must be furnished for each 100 ordered, from which one will be selected at random and subjected to the following test; which it must stand without fracture.

Three (3) blows at 11 ft., and two (2) blows at 16 ft. of a 1,640 lb. weight drop (with a 3-in. pene of $1\frac{1}{2}$ in. radius on end) striking midway between supports 3 ft. apart; the axle to be turned over after each blow. If the axle stands the test without fracture the 100 axles will be carefully inspected, and those only will be accepted which are free from cracks or unwelded seams and which are made and finished in a good and workmanlike manner.

Axles are to be hammered and have journals swaged; new muck bars must be used, which must be tough, fibrous, good neutral iron, uniform in quality, and free from scrap; it must be thoroughly reworked at least once before piling for the axle. If reworked by rolling, the slabs must not be more than $\frac{3}{4}$ in. thick when piled for the axle; if reworked by hammering, the power of the hammer must be sufficient to work the pile to its centre to the satisfaction of the B. & O. inspector. Manufacturers must give every facility for the examination and inspection of these axles.

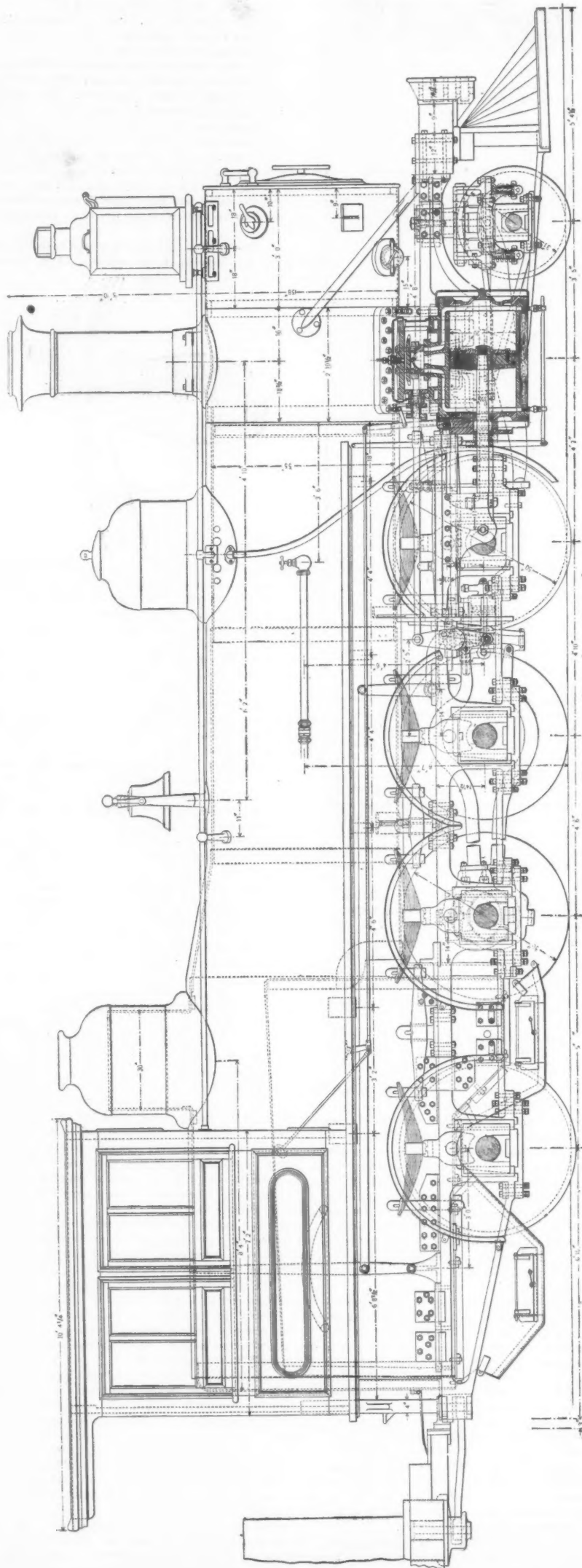
Tires Above 46 in. and Below 60 in., Outside Diameter.

Tensile strength should be 115,000 lbs. per square in., elongation 12 per cent. in four in. Tires will be rejected which have a tensile strength greater than 125,000 lbs., or less than 105,000 lbs. per square in., and if the elongation is less than 11 per cent. in four in. The metal for tires of this class is steel of the following composition: Carbon .65 to .70, phosphorus not over .05, manganese not over .50, sulphur not over .04, silicon .20. Tires will be rejected which do not conform to the above chemical requirements. A test strip of the metal from which the tires are rolled, must be furnished with each set of tires for physical and chemical test. The metal in the test strip will be analyzed and it must conform to analysis which will be afterward made from the borings of the tires.

Tires less than 46 in., Outside Diameter.

Tensile strength should be 125,000 lbs. per square in., elongation 10 per cent. in four in. Tires will not be accepted which have a tensile strength greater than 135,000 lbs., or less than 115,000 lbs., and if the elongation is less than 8 per cent. in four in. The metal for tires of this class is steel of the following composition: Carbon .73 to .78, phosphorus not over .05, manganese not over .50, sulphur not over .04, silicon .20. Tires will be rejected which do not conform to the above chemical requirements. A test strip of the metal from which the tires are rolled, must be furnished with each set of tires for physical and chemical test. The metal in the test strip will be analyzed, and it must conform to analysis which will be afterward made from the borings of the tires.

There are some admirable points in these specifications.



CONSOLIDATION LOCOMOTIVE, CLASS E-6.—BALTIMORE & OHIO RAILROAD.

A. J. CROWELL, Superintendent of Motive Power.

Thus the demand for a slight countersinking of the rivet holes before the rivets are driven is often neglected in the average locomotive specification. The crown bars are specified to have four stays each to the shell of boiler. Generally only two to every other bar is specified. The caution against grooving the lower sheet when caulking joints should always be brought into prominence. The demand that the boiler shall be built in strict accordance with the drawing is not ironical, and should be insisted upon. Boiler makers are too fond of following their sweet will in the matter of small details of boiler construction.

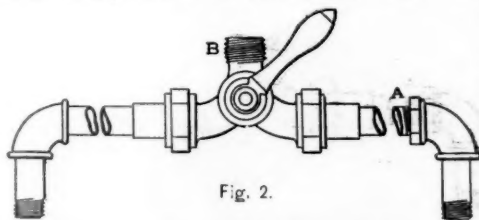
The requirement that the frame pedestals be made of a solid slab is novel but necessary where the appliances for making frame welds are of an inferior order. But if a framesmith shop be fitted with the modern long stroke steam locomotive-frame hammers, frame welds can be made as satisfactorily and cheaper than if made from solid plate.

The provision against jumping on valve yoke stems to the yoke is good and should always be made. No other weld about a locomotive gives more trouble than the one at this point, and nothing short of forging the front sides of the yokes all in one piece will remove it. The driving tires are bored taper to match the taper turned on the outside of the driving wheel centre; the tire is then held in position by lateral bolts.

Indicating Locomotives.

BY LEWIS F. LYNE.

In conversation with a locomotive builder a few months ago I inquired if he gave much attention to indications of his various classes of engines, and he replied: "We build locomotives to draw trains and not to draw indicator diagrams." I believe that the better diagram a locomotive can be made to draw, taking the train at the same time, the more economically will the work be performed. This is common sense. I had my first attack of indicator in the summer of 1880, and I shall always remember it on account of the heat and other experiences I had at that time. I followed the books and tapped the cylinder heads and ran half inch iron pipes to a three-way cock on top of the steam chests. I could not buy three-way cocks with easy bends, so I invested about twenty dollars in patterns and made two



cocks which were afterwards loaned to the manufacturers, who made and improved them for the market. This was the first and only locomotive that I ever tapped in the cylinder heads, for I found that it was not too much work, but also that it would not do to cut up the covers and casings of the cylinders, as was necessary in applying the pipes to the heads. My object was to devise a universal indicator rig, and so tap the cylinders that indicators might be attached in

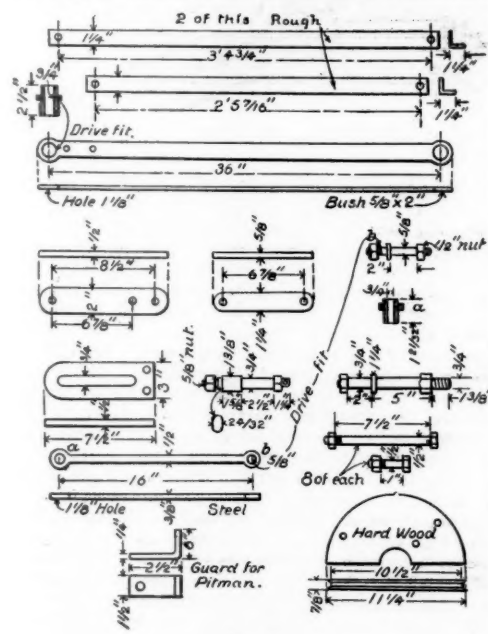


Fig. 3.

an hour whenever required, so I studied out the rig that was applied to locomotive No. 169, Central Railroad of New Jersey, in February, 1882, but without the improvements in details to be described presently. I am indebted to the *American Machinist* for the use of their woodcut to enable me make these alterations.

The cylinders were tapped close to the flanges, as shown in fig. 1, for $\frac{3}{4}$ -in. iron pipe, and brass plugs were inserted. When we wished to apply the indicator the plugs were removed and the fittings shown in fig. 2 screwed fast to the cylinder. Sleeves with collars were screwed on the long pipes and annealed copper washers were inserted in the

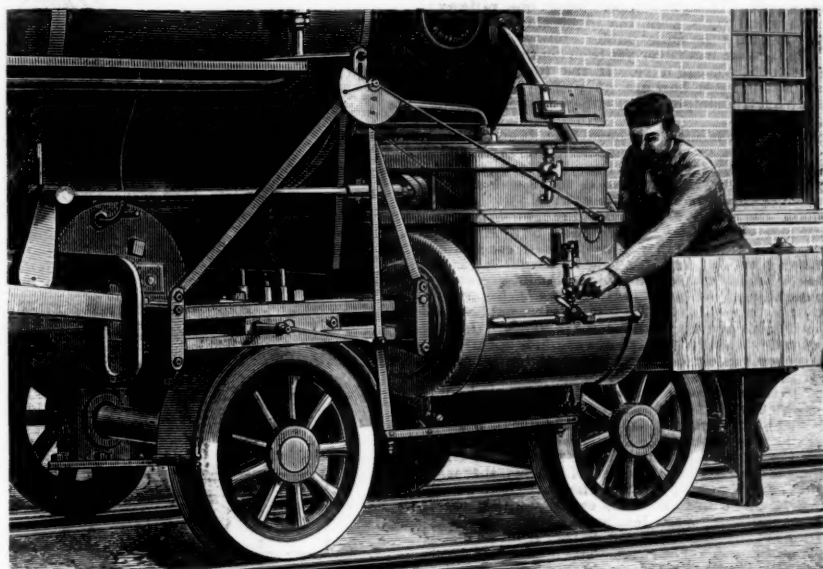


Fig. 1.

LYNE'S INDICATOR RIG.

joints next the cock B. The straight, long thread with lock nut at A is used to take up all the lost motion and make tight joints, a turn of twine or wicking between the lock nut and elbow preventing any leaks. Rubber gaskets are objectionable, for the threads and rubber often get into the indicator. The iron pipes should have the burrs well filed off the ends and all loose scales removed by light hammering. I prefer brass pipe for this purpose, but it cannot always be had. It pays, however, to get it, as when once secured it will last a lifetime, then there is no risk of cutting the indicator cylinder with the scales coming off the inside of iron pipe.

The indicator rig is shown in detail, with dimensions of each part, in fig. 3, from which any one can get all the information necessary to make them. The "Brumby" pulley is turned in a lathe and sawed in two, and one-half is used for each side. The hole through centre should be of the same diameter as the outside of bushing, so that it may be fastened accurately to the lever.

The manner of applying this rig in detail was described in a paper read before the American Railway Master Mechanics' Association and is published in their proceedings for 1883, so I will not repeat it. To overcome the annoyance of hooking on the indicator cord I arranged the pull-up device, which will be readily understood by an inspection of fig. 1. The cord, instead of being fastened to the "Brumby" pulley as usual, passes through a hole in the side, thence through a hole in the end of bolt supporting the top of lever. A loop in the end is hooked over a pin or screw in the side of cylinder as shown. To start the paper drum pull up and hook the loop over the pin, as shown in the engraving. To stop the paper drum, slip off and drop this loop, which will be found very convenient. Care should be observed in leading the cord through the two holes to have them in line so that the cord will not be lengthened and shortened as the lever vibrates. I gave this apparatus to the Stevens Institute at Hoboken several years ago, and the students have, through its aid, secured some very valuable data from locomotives. It has been well appreciated by that institution.

I have tested cards taken both with and without this pull up motion, and found no difference in their length. A hard braided water-proof well stretched Silver Lake cord has proved the best I ever used. The counter used by me during the past four years is one of extreme simplicity, and consists simply of a ratchet wheel with one hundred teeth. A short lever is made to vibrate by means of a cord connecting with the drum motion. A pawl catch upon this lever engages and moves the wheel forward, one tooth at each revolution. The advantage of this counter is one can turn the wheel to zero, and starting off count forward the exact number of units corresponding to the number of revolutions, and read them off at once. Whereas, with a four figured counter two readings have to be taken, and then subtract the less from the greater to get the exact number of revolutions. The ratchet wheel counter that I refer to is made by the Crosby Steam Gage & Valve Co., Boston.

In my paper read before the Master Mechanics' Association in 1883, I used these words: "To make this work profitable for railroad companies, a bright young man should be selected, furnished with the necessary apparatus, and an accurate record kept of all his work." I am very glad to know that there are a number of railroad companies that appreciate this course, among which may be mentioned the New York Elevated railroads. They keep several young men to do all their indicating. The Rhode Island Locomotive Works tap all the cylinders on the sides, as here shown, and screw in brass plugs, then when there is anything wrong or any dispute arises in reference to the performance of any of their engines, two young men are sent out with a pair of indicators to hunt up the trouble. They find it, and thus these locomotives are made to "draw indicator diagrams," as well as loads at the same time, and do it economically. I might mention others if there was time, but I will simply say that so far as I know there is no master mechanic who wishes

to have his engines disfigured by tapping the heads; besides, the diagrams taken with long pipes at high speed are unreliable, therefore the publication of matter advocating the application of the indicator to cylinder heads retards rather than assists the application of the indicator to locomotives.

Chicago Railroad Men on the Situation.

The *Chicago Tribune* has interviewed Messrs. G. R. Blanchard, A. F. Walker, E. T. Jeffery, H. H. Porter, Roswell Miller, Marvin Hughitt, E. P. Ripley, John McNulta, John B. Carson, E. St. John and others, and fills a page and a half with what they say. The questions asked were: Do you believe it possible for railroads under the present laws and system of management to earn a fair return on the investment? Is a system of common ownership and management feasible? Is such a system necessary? Is railroad bankruptcy threatening in the West? If not a trust, what shall be the remedy?

The replies were so uniform in general tone that it would be useless to print them for railroad readers, even if we had the space. We give copious extracts from the remarks of the first two gentlemen named and brief samples of the utterances of a few others. Nearly all the presidents and managers agree that the present outlook is discouraging, and that unless laws are changed combination of some sort must ensue. One or two express a mild hope that the Inter-state Commerce Railway Association will keep the roads out of bankruptcy.

Chairman George R. Blanchard, of the Central Traffic Association, believes that the original capital invested in railroads does not now secure fair commercial returns. Nearly all contracts recently made for the government of railroad associations contain more provisions to protect minorities than majorities. Many of them provide that all questions of revenue must be decided by a unanimous vote, and that means the smallest number, or even one company, exercises a power equal to that of all the other roads combined. Bad management on one road now affects all roads by the operation of law. * * The inevitable tendency is to concentration of interests. The cry is then made that to attempt a pool amalgamation or trust, or to put the rate-making power in the hands of an executive board, is a blow at the public interest, and must be defeated. If all the railroads of the United States defaulted payments on their next coupon and dividend days there would be a financial crash in every other industry such as never was before known in America. * * The rivers, lakes and oceans penetrating and circling the United States are regulators of rates which can never be dispossessed of that natural power. The statistics of every pool that ever was made in the United States, as well as the clearing house results of England, the geographical apportionment of France, and the governmental control of the railways of Germany and Belgium, all prove that under all these forms of concentrated or unified management the rates have invariably been reduced and the public benefited. The trunk line pools lasted practically ten years, and in that time reduced the through charges nearly one half and quadrupled the tonnage movement. The only answer that has been made to these facts is that the rates should have been lower and would be raised by concentration. This, however, is the logic of confiscation, not of compensation. The railway officer who will violate his obligation to maintain reasonable rates should be punished by law as is the manager of a bank who does the same, or a broker on a Board of Trade who violates its commission rate or its rules. But a large majority of the merchants on the Chicago Board of Trade would to-day applaud a railroad agent who violated his duty to his employers by cutting the rates, and, instead of being expelled from the floor of that body, he would be rewarded with an increased volume of business. The best proposition is that for a restoration of the right to pool, under such limitations of law as to provide for the proper protection of railway-owners on the one hand and railway-users on the other. Pools before being put into effect should be submitted to the Inter-state Commerce Commission, and if found to contain nothing antagonistic to public policy, or the written law, and the rates not excessive or discriminating, should be authorized by the commission to be put into effect from year to year, but revocable in the judgment of the commission or whenever upon proof the pool contracts were used to produce injury. Monthly or quarterly statements of all the settlements made under such pools should be transmitted to the Inter-state Commission at Washington for examination and publication if it saw fit. This plan exhibits its doings to the public, and does

not advance rates. It merely maintains them; the public misapprehends a pool. If eight shippers using one railway should have the same rates, then the eight shippers using eight railways should for the same public reasons have the same rates. This axiom has never yet been controverted by any opponent of pools, nor can it be. If the Iowa Commission authorizes certain rates, how are its people harmed or those rates made hurtful simply because they are maintained by the State pools.

Amalgamation and consolidation have long been public benefactors. They have in every case reduced rates and fares by changing the aggregate of various local charges into lower through tariffs; they have increased the speed of all trains, they have bettered facilities, they have put better equipment upon the lines, they have brought Western farmers nearer and cheaper to the seaboard buyers, they have produced safer railroads, they have lessened corporate interference with legislation, and they have made practicable the fairer relation of local to through rates. A manager controlling 5,000 miles is always more conservative than one who controls fifty. He looks at the public interests as related to his own from wider standpoints. Upon the question of trusts a broad field for discussion is open. ** The public, however, has one constant safeguard against railway trusts. If railway rates are put too high the courts will reduce them. If the charges, however, for cotton-seed oil are too high under trusts they cannot be reached.

3. If low rates yield large profits, that is no argument whatever, standing alone, why the rates should be reduced, any more than that the patent laws should all be revoked for the same reason. It is clearly to the interest of Chicago that its traders organize as a board of trade. The fact that they push grain or pork up or down in value every day depending upon storms, sunshine, wars, famine, and the caprices or manipulations of its rings, does not detract from its ultimate general usefulness. The fact that a railroad organization, being governed by men with similar minds and objects, permits the same causes to change their rates from time to time cannot be argued as a sin among railroads. It has never been charged that the Chicago Board of Trade attempted in its corporate capacity to extort or do injustice. No railway organization comprising a number of railroads within the United States ever sought to extort or do injustice. In the aggregation of their common interest the majority will always be fair and honorable, and a dishonorable minority will be voted down as quickly by railroads as by merchants.

The fact that the majority of the roads affected by the present tendencies of legislation operate in the more sparsely settled portions of the country, where the demands for improvements in the condition of the roads and the reductions in the rates more than offset all the economies that the railway officers can practice, and the increase of tonnage which they can stimulate, must lead those companies into bankruptcy if they are supplemented by dissensions among the railroads themselves. There could be great improvements made in requiring boards of directors to meet more frequently, pay them for their services, require them to scrutinize and audit more closely, and have a greater measure of accountability taken from managing officers by these boards. This is the case in England, and is the case with the larger companies in this country organized to advance other enterprises, like the Equitable Insurance Company of New York and other notable instances of corporate success. It should be more the rule of railroads.

Chairman A. P. Walker, of the Inter-state Commerce Railway Association, said: "Under existing conditions, the association of carriers is an absolute necessity. The act to regulate commerce cannot be enforced without it. The various points necessary to be covered in the establishment of tariffs and regulations controlling transportation are so numerous that harmonious action between carriers is absolutely necessary in order to secure the first step toward the administration of the Inter-state Commerce Law, namely, the establishment of tariffs which, the law says, when established shall be maintained. Since the passage of the act railroad associations have been continued in existence for the above and many other legitimate objects; their administration has usually been intelligent and progressive, and they have been of much assistance to the Commission in the way of what has been accomplished in the enforcement of the law. A consolidated ownership of railroads would radically differ from the usual manufacturing or producing 'trusts.' The latter are practically without control; while Congress has already established an enactment that railroad rates must be no more than what is just and reasonable, and has provided machinery for its enforcement."

The person who regards the important object of governmental regulation of railroads to be the procurement of lower rates has not passed beyond the primer in his study of the subject. Passengers, shippers and the public generally are interested in safe and efficient railway service more than in extremely low rates. Rates may be so ruinously low as to render such service impossible. English tribunals have affirmed healthy competition to be that in which various transportation routes are kept on foot which are 'practically independent of one another, fairly alternative, and reasonably calculated to keep one another in check.' Yet competition in rates is practically unknown in England. ** Association among carriers is therefore required by sound public policy; it establishes rates coordinated with the value of the service and adjusted to the expenses of the shortest routes. It assists to preserve all lines in competitive existence.

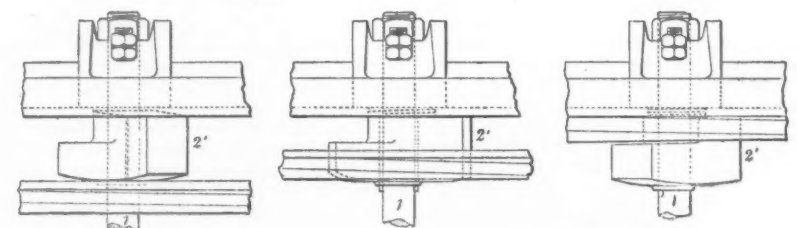
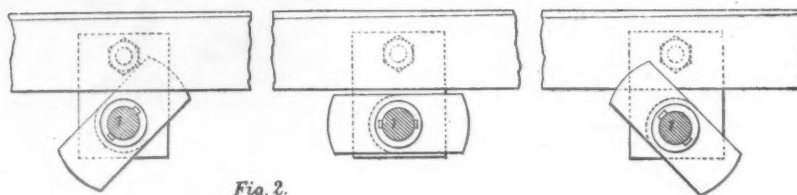
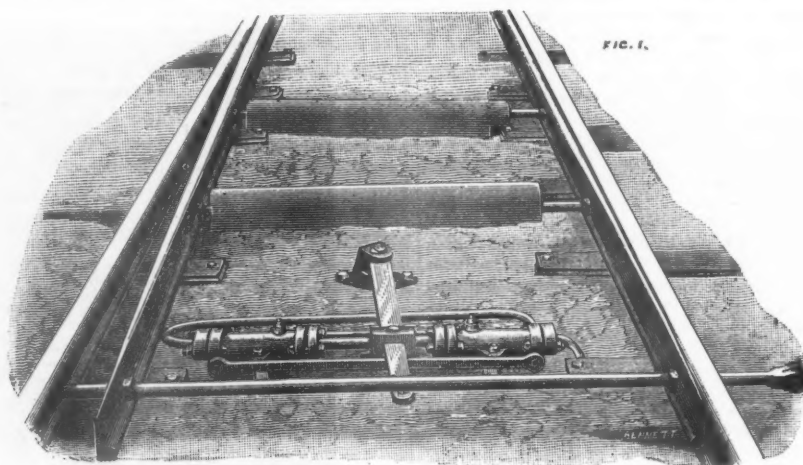
No one would admit the desirability of railroad bankruptcies; few would support any project for state control; a combination of railroad owners would be the most natural result of the failure of the present experiment in the statutory regulation of railways through the assistance of railway associations. While this experiment is pending, and while a reasonable prospect for its success continues to exist, I must decline to discuss the question of a railway trust."

General Manager E. P. Ripley, of the Chicago, Burlington & Quincy says: "We try to agree among ourselves as to rates with just the same success—and no more—as attends similar efforts in other lines of business. Ask any merchant on the street what has been the history of agreements to maintain prices. He will tell you that such agreements have never been kept and never can be, and that they have been so invariably broken as to make most men now unwilling to enter into them. If such agreements cannot be kept as between two or three dealers on the same street, how is it possible to maintain them among railroads, involving not only the competition of railroad with railroad, but of city with city, state with state, and commodity with commodity?"

General Manager E. T. Jeffery, of the Illinois Central, says: "If the general government does not, through its board of railroad commissioners and through its courts, take control of all traffic, state and inter-state, there is no possible solution of the present embarrassing difficulties of railroad carriers except by combination. Duties on imports and exports between states are no more indefensible than legislation by a state to advance its interests commercially at the expense of its sisters and their citizens by passing selfish and narrow transportation laws."

General Manager E. St. John, of the Chicago, Rock Island & Pacific, speaks in a similar vein on this point.

H. H. Porter, President of the Chicago & Eastern Illi



BIANCHI & SERVETTAZ'S HYDRAULIC INTERLOCKING MACHINE.

nois, says: "I think the attitude of the press and the consequent temper of the people are breeding a greater panic than the country has ever seen."

Bianchi & Servettaz's Hydraulic Interlocking Machine

In the Italian Section of Class 61 of the Paris Exhibition, devoted to railroad material, the above named persons exhibit the apparatus shown in the accompanying illustrations, for moving switches and signals with the aid of hydraulic power. The system was tried some time since at the station of Abbiate Grasso, on the line from Milan to Alexandria and Mortara, and the results obtained were so satisfactory that the Italian Railway Co. of the Mediterranean system decided to adopt it at several stations, while the Paris, Lyons & Mediterranean, and the Paris & Orleans, of France have also obtained several sets of apparatus. Complete models illustrating this system are exhibited in the northwest corner of the Machinery Gallery.

The switches are operated by means of two plungers mounted on the same rod, but of unequal diameter, so that when the cylinders are put into communication either with the accumulators, worked to a pressure of 650 lbs. per sq. in., or with the discharge reservoir, the plungers travel toward the right or left, and give a corresponding motion to the switch rails. Fig. 1 shows the arrangement adopted for operating an unlocked switch. The apparatus is placed between the rails, and as no special arrangements for control are required, there are only two lines of pipe, one communicating with the accumulator and the other with the discharge reservoir. Locking is effected by means of cams which operate independently for each rail; they are mounted on the ends of a rod that is caused to rotate by means of a crank rod moved by the plungers themselves; these cams have the form and occupy the position shown in fig. 2. When it is desired to lock by a separate lever, a small supplement-

ary apparatus, as shown in fig. 3, is placed on the outside of the track in the extended axis of the locking cam rod; the controlling mechanism makes communication by a third and so-called return main with the pressure main in such a way that the movement is repeated within the signal cabin. If the operation is complete, and the switch is properly locked in its new position, the repeater unlocks all the levers locked with that of the switch. From this it will be seen that if the control is inefficient, and if the point does not answer to the movement, or if the locking is not perfect, the signalman is apprised of the fact by the impossibility of operating the other levers that are not unlocked. The semaphore signals are operated by a single cylinder, the plunger of which lifts the counterweight of the arm by direct pressure (see fig. 4). The position of the signal arm or the colors shown by lamps after dark, can be indicated by a repeating screen and lamp placed within the signal cabin. In working distant signals a double wire is used. The liquid used for transmission is a mixture of water and glycerine, and is supplied to the plunger through pipes about 1/4 in. in diameter; power is obtained from a small accumulator that is charged from time to time by means of a hand pump, the liquid being brought back from the discharge reservoir, and the signalman having this work under his charge. About five minutes' pumping is sufficient for accumulating power for fifty manipulations of the levers.

Fig. 5 illustrates the arrangement of the levers in the signal cabin; the handles are arranged with their upper ends in a vertical box that carries a locking bar. The controlling plunger is intended to completely reproduce the movement of the plunger actuating the points, so that if the operation of the switch mechanism is imperfect, the levers in the signal box cannot be moved.

For the description and illustration we are indebted to *Engineering* (London).

Consumption of Coal as Affected by Enginemen.

BY GEORGE H. BAKER.

As the cost of coal forms such a large proportion of the expenses of railroad operating, and as it is well known that but a small fraction of the heat energy contained in the coal is converted into the actual work of pulling cars, fuel economy is generally an important but vexed subject for railroad officers to consider. But no subject of railroad operating is more worthy of careful consideration, for operating expenses can be reduced more by a careful use of coal than by any other line of economy.

The consumption of fuel by locomotives depends greatly upon the men who have charge of them while they are engaged in doing work, as well as upon the condition and equipment of the engines. The popular error has been in supposing that the consumption of fuel depended mostly, if not entirely, upon the condition and equipment of the engines, and that the enginemen had really but little to do with the amount of coal the engines consumed in doing their work. The contrary is the case. In every kind of work that locomotives can perform the engineer exerts a potent influence on the cost of operating. From the moment he enters the cab at the start, until he leaves it at the terminus of the trip, the economical operating of the engine depends mostly upon his management. As he is careful or careless there may be a saving or waste of fully a ton of coal per day, or trip of 100 miles. This is no exaggeration, and numerous cases can be shown where the difference between careful and careless management, while doing practically the same work, has been 50 per cent. more than this. There are many ways by which an engineer may affect the coal consumption of his engine while it is engaged in pulling trains over the road, and an engineer who may be considered an excellent runner because of the care and judgment he exercises in handling trains, may yet operate his engine in such a manner as to cause an extravagant consumption of coal.

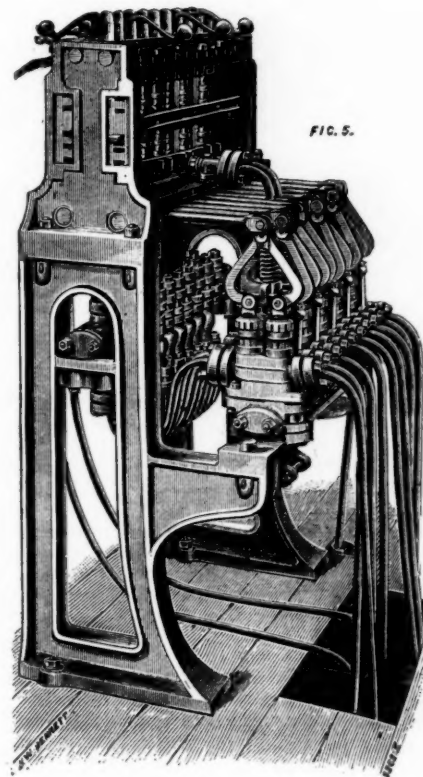
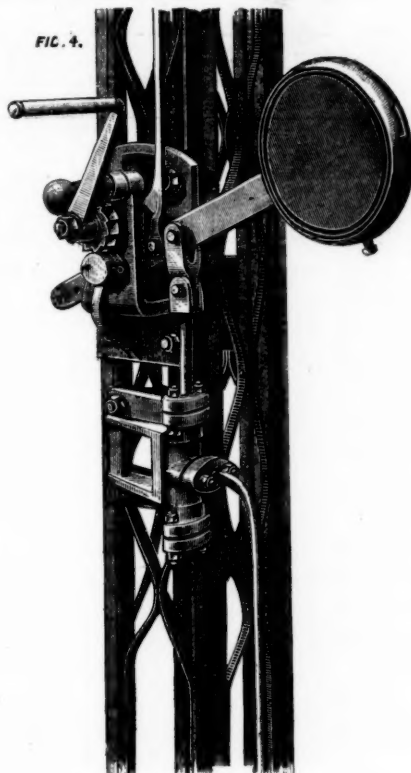
Care for the safety of his engine and train is, of course, an engineer's first duty, and the one to which he is held most strictly. The next requirement is successful running—pulling his train over the road promptly and on time, getting up the hills all right, and making meeting points in time to avoid delays to his own and other trains. At present, upon most railroads, engineers who satisfactorily meet these two requirements, and take proper care of their engines, fill the bill. But the time is fast passing away when this will be the case. Competition is narrowing the margin of earnings until the strictest economy in operating is demanded, and when it is understood to what extent engineers can influence the operating expenses of the engine in their charge, they will be held to strict account for the economical operating of the same.

The best way to economize is to prevent waste, and waste of fuel on locomotives results from enginemen not being sufficiently impressed with the necessity of preventing it and of the evils of wasteful practices, of which there are many. The most wasteful practice indulged in is, no doubt, the use of steam with a later cut-off than is necessary to do the work, and then by throttling, reduced in pressure so as to perform only the desired amount of work. The same amount of work could generally be done by cutting off earlier in the stroke and keeping throttle full open, so as to utilize the full boiler pressure, with a great deal less steam. This directly affects the coal pile. Engineers have many prejudices against using steam with full throttle and early cut-off, and it is safe to say that except a small proportion of their number, and upon a few roads where the waste of using throttled steam is not tolerated, locomotives are generally operated with later cut-offs than is necessary, and steam throttled to low pressure. This is wasteful of fuel in several ways: More steam is used than is necessary; back pressure in the cylinders is greater, and the exhaust steam escaping at a much higher pressure than it would with early cut-off and high initial pressure causes a stronger draft on the fire, which hurries the hot gases and products of combustion from the heating surfaces before their heat has been absorbed by the water in the boiler. Engineers should understand these facts, and be disabused of their wrong ideas of the ill effects of running with full throttle and the shortest possible cut-off consistent with the work required.

Next to the manner of using steam, that of feeding water to the boiler affects the coal consumption of a locomotive more than any other cause. A great amount of heat energy can be stored up in a few pounds of water. Take for illustration the water space in the boiler of an ordinary four-wheel coupled engine, the water level of which is indicated by a column of water in the water-glass. The rise or fall of the column of water in the glass one inch indicates an increase or decrease of four cubic feet of water in the boiler. Under 145 pounds steam pressure, each cubic foot of water in a boiler is stored with 18,850 units of heat (from 32 deg.); one inch of water in the glass therefore represents a store of heat in the boiler of $(4 \times 18,850 =)$ over 75,000 heat units. In practice, the water level, as indicated in the glass, may, with perfect propriety, vary eight inches. That is to say, an engineer can start out with his water glass nearly full of water, indicating the water level in the boiler to be eight inches above a good fair margin for safety—several inches yet above the heating surface. These eight inches represent a store of heat of $(8 \times 75,000 =)$ 600,000 units. As the source of a locomotive's power is heat, this represents a capital stock to start with, which may be drawn upon with great advantage in emergencies of hard work, such as starting trains and forcing them into speed.

An engineer understanding this aims to always start with the boiler as full of water as he may and avoid priming, and

then assists his engine to economically perform the hard task of forcing the train into speed by leaving his injector off at such times, and drawing upon his store, instead of upon his fire, for a large amount of the heat necessary for the work. In this way, and by adjusting the injector at other times to feed a less amount of water to the boiler than what it is parting with as steam, he draws upon the store of heat represented by the full glass of water as far as it is practicable, possibly to a third or a quarter of a glassful, and thus favors



Bianchi & Servetaz's Hydraulic Interlocking Machine.

his engine all he can while it is performing hard work; and then, while running into the next station, or down the next hill, with steam shut off, he refills his boiler with water and recuperates his store of heat, guarding, while doing so, against changing steam pressure or temperature of boiler. Engineers not understanding these points, and there are many, will of course take no advantage of them, and the coal record of their engines will suffer accordingly.

Wasteful practices in firing also cause serious waste of coal. From the start to the completion of the trip the actions of the fireman noticeably affect the fuel consumption of an engine. He should understand the principles of combustion, and that air is simply the other part of the fuel of his fire, and as necessary to it as the coal upon the grates, so that he may appreciate the importance of providing for a

sufficient supply of air to his fire, and not allow the grates to become choked with ashes and clinkers, which, by restricting the admission of air, causes much of the coal to burn to carbonic oxide instead of carbonic acid, and thus in burning yield only a third of the heat it is capable of giving out.

He, too, should prepare beforehand for emergencies of hard work, by having his fire in such condition and sufficiently supplied with coal before the hard task of work is commenced, that the fire-door may remain closed as much as possible while the draft of the exhaust is strong, and thus prevent the inrush of the immense volumes of cold air into the fire-box, that always enters at such times and absorb the heat of the fire and cool the temperature of furnace and flues. Many firemen are careless about this point, and much waste of fuel and injury to fire-boxes and flues are the results. Surplus steam blowing off at safety-valves, or "popping," is noticeable and general upon all railroads, but the waste of coal resulting is little appreciated.

Some months since I traveled from Chicago to New York over a railroad noted for the strict economy exercised in its operation, especially as regards the use of coal. I was somewhat surprised, therefore, to hear the engines frequently popping, sometimes for minutes together, while stopping at stations. Change of engines did not alter the frequency with which the safety-valves relieved the boilers of surplus steam. At a divisional point, where two fresh engines were taken on to climb a mountain, there were a number of engines standing around, and I counted eight that were popping. Shortly after, my interest in a famous bit of scenery was somewhat lessened by mentally criticising the carelessness of enginemen who would allow two engines to blow off continuously during the several minutes used in passing the place. On my return, although in the rear car of a long train before the start, the scream of escaping steam, continuing without abatement, caused me to seek the cause. I found it in the engine attached to the train I was on. The black smoke issuing from the stack indicated a heavy charge of coal on the fire, although it was several minutes of leaving time. The fire-door stood wide open, presumably to check the generation of surplus steam, by admitting cold air to the furnace to counteract the heat of the fire; but as both dampers were wide open, and the blower on quite strong, surplus steam was formed as fast as it could blow away. The popping continued without intermission for five minutes until the train started.

The fireman was certainly careless, or ignorant of the waste attending the escape of steam, and of the principles of combustion, which required him, if he wished to check the generation of surplus steam, to shut off the blower, which only stimulated his fire to a greater heat, and to close the dampers, and thus cut off from the fire the other part of its fuel—the air. The engineer in charge was equally careless, or ignorant of the advantages of a store of heat to start with. Judging from reliable data, no less than 8 cubic ft. or 447 lbs. of water were converted into steam and blown away during the five minutes the blowing off continued. So, aside from the waste of heat (coal) that went to convert this amount of water into steam*, the boiler was deprived of a store of 150,000 heat units to start with, and the engine robbed of the economical advantage of the same, which was nearly as great a loss as the original. That such wasteful practices are indulged in and permitted upon a railroad noted for the economy of its management is evidence that there is wide room for the improvement of locomotive enginemen generally as regards the use of fuel. Education in regard to the proper use of fuel, the principles of combustion and the evils of wasteful practices, is what is needed to improve the service and decrease the consumption of coal, but what has until recently been considered quite unnecessary. Only in the June number of the *Master Mechanic* a correspondent sneeringly remarks that too much "high science" is being advocated in the operating of locomotives. The trouble is, and always has been, that the coal consumption of locomotives, and through it the profits of railroad operating, is suffering from the lack of this very "high science" that many very "practical" men regard as superfluous.

The science of steam engineering is knowledge and conception of its general principles, but the "higher" it is, the greater the knowledge and the clearer the conception, the greater the skill of the engineer, and with due care, the greater the economy of his engine.

In locomotive operating, greater than in any other line of steam engineering, because of the nature of locomotives' work, the consumption of coal depends upon the care of engineers and firemen, and upon their knowledge of the influences at work during the process of the production of heat, and the conversion of its force into useful work; and their cooperating with each other in the proper management of their engines.

A practical illustration of what has been said above will be found in the following record comparing the average monthly performances of several engines with those of engines under the charge of H., running on the same divisions and in the same service.

All six-wheel coupled engines; level road.			
	Average miles run.	Average tons of coal.	Average miles run per ton.
Twelve engines.....	2,354	93	25.3
Engine A.....	2,578	73	35.3
Difference.....	224	20	10.0

A saving of 22.4 lbs. of coal per mile run by engine A; amounting to 28.8 tons, or \$43.20, in month's service.†

* Computing six lbs. of water converted into steam per lb. of coal burnt, a fair average, about 75 lbs. of coal were consumed to furnish the heat.

† Cost of coal on tender, \$1.50 per ton.

August, 1886.

All six-wheel coupled engines; level road.

	Average miles run.	Average tons of coal.	Average miles run per ton.
Eleven engines.....	3,223	139	23.2
Engine A.....	3,820	125	30.5
Difference.....	597	14	7.3

A saving of 20.7 lbs. of coal per mile run by engine A; amounting to 40.5 tons, or \$60.75, in month's service.

September, 1886.

All four-wheel coupled engines; hilly road.

	Average miles run.	Average tons of coal.	Average miles run per ton.
Nine engines.....	2,556	115	22.2
Engine B.....	2,868	86	33.3
Difference.....	312	29	11.1

A saving of 30 lbs of coal per mile run by Engine B, amounting to 43 tons, or \$64.50, in month's service.

November, 1886.

All four-wheel coupled engines; hilly road.

	Average miles run.	Average tons of coal.	Average miles run per ton.
Nine engines.....	2,185	118	18.6
Engine B.....	2,562	98	26.1
Difference.....	377	20	7.5

A saving of 30.9 lbs. of coal per mile run by Engine B, amounting to 39.5 tons, or \$59.25, in month's service.

January, 1887.

All four-wheel coupled engines; hilly road.

	Average miles run.	Average tons of coal.	Average miles run per ton.
Nine engines.....	2,344	131	17.8
Engine B.....	3,117	136	22.9
Difference.....	773	5	5.1

A saving of 25 lbs. of coal per mile run by Engine B, amounting to 39 tons or \$58.50, in month's service.

April, 1887.

All six-wheel coupled engines; hilly road.

	Average miles run.	Average tons of coal.	Average miles run per ton.
Ten engines.....	1,965	116.5	16.8
Engine C.....	2,387	115	20.8
Engine E.....	1,430	64	22.3
Engines C and E, average.....	1,817	79	24.0
Difference.....	148	37.5	7.2

A saving of 37.5 lbs. of coal per mile run by Engines C and E, amounting to 32.4 tons, or \$48.60, in month's service.

June, 1887.

All six-wheel coupled engines; hilly road.

	Average miles run.	Average tons of coal.	Average miles run per ton.
Nine engines.....	2,913	158.3	18.4
Engine E.....	2,556	109	23.4
Difference.....	357	49.3	5.

A saving of 22.8 lbs. of coal per mile run by Engine E, amounting to 29.2 tons, or \$43.80, in month's service.

November, 1887.

All six-wheel coupled engines; hilly road.

	Average miles run.	Average tons of coal.	Average miles run per ton.
Seven engines.....	2,193	130	17.0
Engine E.....	2,432	102	23.8
Difference.....	239	28	6.8

A saving of 34.7 lbs. of coal per mile run by Engine E, amounting to 42.2 tons, or \$63.30, in month's service.

Here we have eight cases of practical locomotive running in the heaviest service of a railroad, with the heaviest and lightest classes of engines the company used in that service, on different divisions of the road—easy and difficult—and all different seasons of the year.

Yet, with all these changes, the record shows an average saving of 2.777 lbs. of coal for every hundred miles run, or an average monthly saving of 37 tons, or \$55.50, by the engines in charge of Engineer H., as compared with the performance of all other engines of same general dimensions and in same service. The saving was effected, not by any superiority of the engines H. ran over the other engines, because none existed; nor to fuel-saving appliances, because there were none attached to the engine he ran, but such as the others were also equipped with. It was simply due to care in operating the engines with a full throttle and as early a cut-off as possible, consistent with the work to be done, and careful boiler feeding.

To demonstrate this more clearly we will take a case where a saving of 36 tons of coal was effected in a month's service of an engine, with no change whatever but engineers. The instance is that of engine E, and its fuel performance for November, 1886, four months after being rebuilt, and in charge of Engineer —, compared with the same performance in November, 1887, in charge of engineer H. The engine was unchanged in 1887, except being one year the worse for wear and scale. The same man fired the engine in both cases, and as the seasons of the year were the same it is not likely there was any material change of temperature of feed water, air or fuel.

During both months and intervening year the engine was in regular through freight service on same division.

	Tons of coal.	Miles run.	Average miles run per ton.
Engine E, November, 1886.....	165	2,916	17.6
Engine E, November, 1887.....	102	2,432	23.8

This represents a saving of 29.6 lbs. of coal per mile, run in Nov., 1887, or 36 tons, \$54, in the month. One more instance in a different class of service will be sufficient to illustrate, plainly enough, to what extent an engineer can

* In charge of H.

A ten-wheel Rhode Island engine, hilly road.

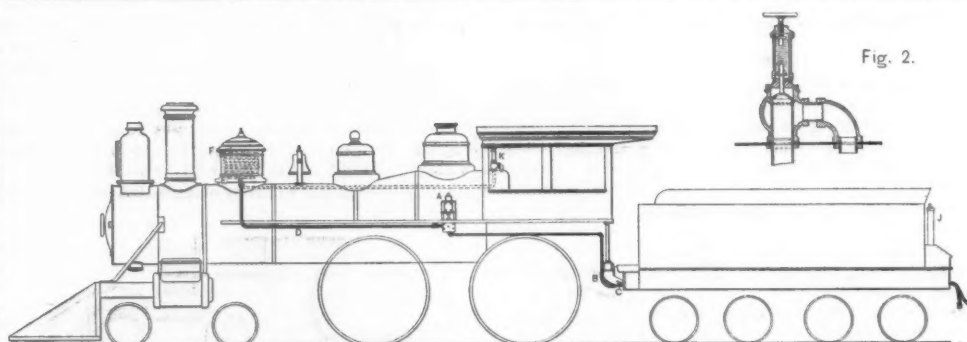


Fig. 1.

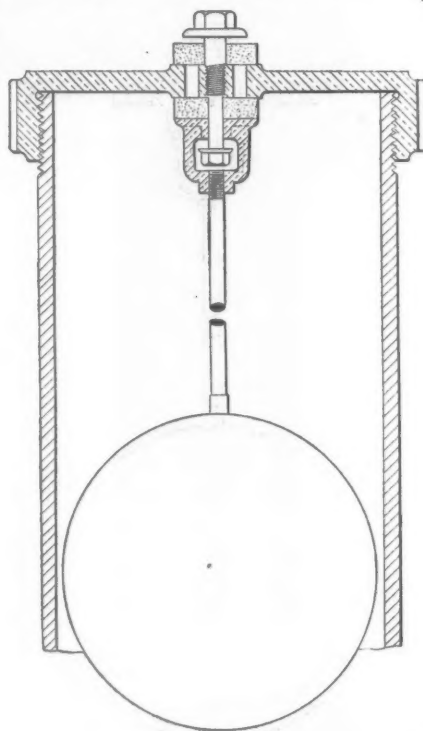


Fig. 3.

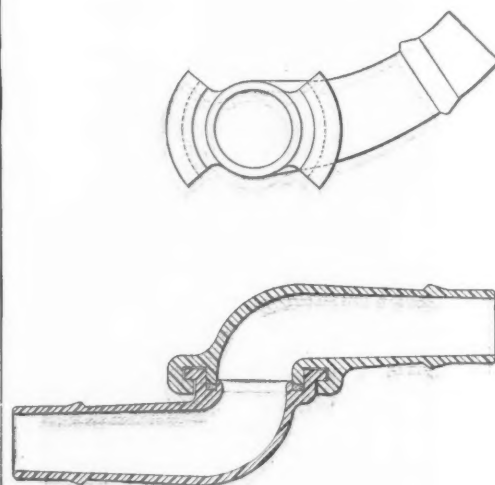


Fig. 4.

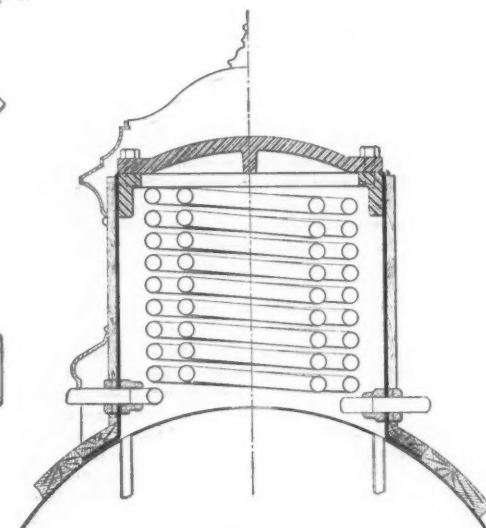


Fig. 5.

WILSON'S HOT WATER HEATER.

Made by the WILSON CONTINUOUS CAR HEATER CO., Pittsburgh, Pa.

influence the operating expenses of the engine in his charge, in nearly all the different and changing circumstances of railroad work.

We will compare the coal consumption of four engines engaged in local freight service on the same division. The engine run by H. will again be designated by its letter:

August, 1888.

	Average miles run.	Average tons of coal.	Average miles run per ton.
Three engines.....	2,251	106.3	21.1
Engine B.....	2,659	85	31.3
Difference.....	408	21.3	10.2

A saving of 30 lbs. of coal per mile run by engine B, or 3,000 lbs. per 100 miles run, amounting to 40 tons, or \$60, in month's service.

All were four-wheel coupled engines, cylinders 17 x 24. Engine B was in the poorest condition of any, and the crown sheet was so badly covered with mud that the next month it was mud-burned, and the engine had to be taken from service several weeks for boiler repairs. One of the engines we have just matched its performance with was equipped with extension front, open stack, brick arch, sight feed

lubricators and smoke preventing appliance. Engine B had none of these, simply a plain fire-box and diamond stack, yet its performance, as compared with this other particular engine, shows a saving of 27.4 pounds of coal per mile run by Engine B, amounting to 36.4 tons (\$54.60) in the month's service, both engines in the same service, on the same piece of road, doing the same work and arriving at each end of the division always on time. This practically demonstrates how much more the coal consumption of locomotives is affected by engineers than by either the condition or equipment of engines.

Wilson's Hot Water System of Car Heating.

This system was tried, experimentally, on some of the trains of the Pennsylvania system west of Pittsburgh last winter, with results that warrant us in bringing it to the attention of our readers.

The application of the apparatus to an engine is shown in fig. 1. The steam pump A has a supply pipe connected to the tank by means of the hose pipe B and three-way cock C. The discharge pipe D of the pump is connected to the copper

heater coil *E*, placed in the independent dome *F*, shown on a larger scale in fig. 5. Connection is also made back to the train, with a flexible hose between the cars. The extremely simple coupling is shown in fig. 4. The heater pipes in cars can be of any suitable design.

The valve *K* shown in the cab and also in fig. 2 is a regulating valve set to admit steam from the steam space of the boiler to the dome containing the heater coil for heating the water that is to heat the train. The valve can be set to admit steam in any desired quantity from one to 100 lbs. pressure.

The air relief valve *J*, located back of tank, is for the purpose of automatically exhausting the air in the train pipe when it is being charged with water, or additional cars are coupled to the train. This is shown in detail in fig. 3.

The operation is as follows: The three-way cock *C* is opened to admit water from the tank to the pump, which forces it through the heater coil *E*, and thence through the train pipes back to the three-way cock *C*. When the train pipes have been fully charged with water, as indicated by the gauge in the cab, the three-way cock is shut off from the tank supply, which admits the water from the train pipes into the pump, and it is then forced through the heater coil continuously.

It is said that the pressure in the train pipe need never exceed 10 or 15 lbs., and that after the circulation is established the steam supply may be shut off from the heating dome, and the circulation maintained by the heat of the boiler.

American Railroad Statistics.*

HISTORY.

1. The oldest, and for many years almost the only, source of statistical information consists of the reports of the railroads themselves.

From the very first such reports were annually made by the directors to the stockholders. If properly arranged they furnish a large part of the statistical information which interests the general public. They should contain an account of the permanent expenditures on the property, and the means by which they are met, whether stock, bond, floating debt, or surplus earnings. This forms the general balance sheet. To this should be appended a description of some of the physical characteristics of the road—length of line, bridges, buildings and equipment. In addition to this, and distinct from it, is the income account for the year, giving a classified summary of receipts and expenditures, to which is appended an account of the work done, the miles run by trains of various descriptions, the amount of freight and passenger transportation. The stockholders must have these facts fully presented to them in order to know the condition of their own property; and any presentation which can properly satisfy the stockholders gives most of the information which the public requires.

Unfortunately, few of the earlier railroad reports were made out in this form. At the outset the directors themselves did not know enough to do so. The complete separation of capital and revenue account was comparatively new. Few manufacturers employed it to anything like the extent in use at present. As a consequence, the balance sheet of a sheet of a railroad was arranged like that of a bank. Income and property balances were jumbled into one mass. The result was hopeless confusion.

Even when they had begun to learn how railroad accounts should be arranged many of the directors continued to follow the old practice. They did not regard it as desirable to present the facts fully and clearly. It does not necessarily follow that they were dishonest. They had an exaggerated idea, in many cases, of the importance of business secrets. They conceived that more harm was done by making business conditions known to the public than by concealing them from the stockholders. This was a wholly wrong view; but it was held by many people who should have known better. If we add to these cases the number of those railroads which were dishonestly managed, and where concealment was sought with fraudulent purposes, we should see how incomplete was the information to be expected from the voluntary action of the directors themselves. A few companies gave good reports, the majority gave bad ones.

Apart from the question of goodness or badness of individual reports, the diversity in minor details rendered them nearly useless for general statistics. One railroad gave its information in one form, another in another; any attempt to summarize the two was out of the question. Twenty-one years ago Mr. Henry V. Poor published the first number of his "Manual," which has since been a standard book of reference. For more than 10 years he could do little more than to publish the reports of the several companies with but slight attempt at any summary. He could give general statistics of mileage, perhaps with some approach to accuracy, and, with less confidence, a few leading items with regard to capital and earnings, which were common to all reports. But any detailed description of work done was wholly impossible.

2. The next important source of information is found in the reports of state officials. New York, by Act of 1849, took the lead in this matter. Beginning with 1850, we have pretty complete transportation reports of New York railroads to the State Engineer. The requirements were good, decidedly ahead of their time; their fulfillment was, of course, imperfect. Efforts were made to extend the powers of the state authorities. A proposal for a commission, made by the State Engineer in the report for 1854, is 15 years in advance of what was finally accomplished in Massachusetts. But the crisis of 1857, and then the war, turned men's minds in another direction. A few states followed the example of New York, but without important statistical results. In principle this may have marked a slight advance over that state of things where we had to rely on voluntary reports of directors to stockholders. In practice the difference amounted to very little. The State Engineer had neither the time nor the powers to inaugurate any real reform.

The rise of the system of railroad commissions gave an opportunity for more effective work. As early as 1871 the Massachusetts Commission turned its special attention to the subject of accounts. It made haste slowly, consulting with the officials of the different companies. The classification of earnings gave no trouble. The account of work done was brought into such shape that all the companies reported it on a nearly uniform system, without much delay. But the arrangement and subdivision of expenses was a much more

complicated problem, and it was a number of years before anything like uniformity could be obtained in this respect.

The efforts of the Massachusetts Commissioners met a hearty response from other states, not merely from the Commissioners themselves, but from far-sighted railroad men, who saw that the old system of secrecy was an evil, and true publicity a protection to legitimate interests. A preliminary convention to secure uniformity of returns was held in 1877; a more important one at Saratoga in 1879, which agreed upon certain points with regard to the classification of operating expenses. This arrangement, known as the Saratoga classification, has been at the basis of all subsequent railroad statistics; but it was so far indefinite as to leave room for a great deal of divergence in practice, even by those who conformed to its general requirements.

Totally apart from the question of any such divergence, state statistics of railroad operation are not particularly good. State lines form an artificial boundary which railroad systems pass and repass at a number of different points. It is possible to ascertain the mileage within a given state; it is not possible to ascertain with anything like the same accuracy either the receipts or expenses belonging to that state. Any such apportionment must be wholly arbitrary. Sometimes it is not made at all; generally it is made in such a manner as to be useless. Most of the inferences with regard to the volume of traffic which could be obtained from the state reports, as such, would be positively misleading. If we had to choose between a set of state reports thus and a set of reports of different railroad companies arranged on a uniform system, the latter would be far more useful. The separate railroad systems have far more unity and independence than the separate state lines. In the one case the division is organic; in the other it is accidental. The best statistical work done by the state commissions was first in familiarizing the railroad men with the idea of publicity of accounts, and next in laying down a few of the general principles by which such publicity can best be secured. When the Inter-state Commission has brought its statistical work into more advanced shape, it is most sincerely to be hoped that the state statistics will be treated as subsidiary. Recent events show a tendency in this direction. A convention of state railroad commissioners, held at Washington last March, decided to conform their respective accounts, in all essential features, to the requirements of the form prescribed by the Inter-state Commissioners.

3. The first systematic collection of national railroad statistics is to be found in the fourth volume of the United States Census of 1880. This contains:

1. The income account (not fully itemized) of the railroads of the country for the fiscal year 1880.
2. The general balance sheet (permanent assets and liabilities) in detail.
3. Financial results of traffic operations—itemized earnings and expenses.
4. Physical description of traffic operations—not quite complete.
5. Analysis of character of freight.
6. Description of equipment and employees.
7. Statistics of accidents—not complete, owing to imperfect record of the companies themselves.
8. History of construction.
- 9-12. Physical statistics of track.

Supplementary tables give more detailed analysis of funded debt, land grants, outstanding contracts, etc., but by no means wholly complete exhibits.

On the whole, the transportation work in the Census is wonderfully well done. In spite of the difficulties under which the authorities labored, owing to the newness of the work, the result is fully as good, if not better, than that which has been obtained in the same field in any other country; and is, in certain essential features, better than what the Inter-state Commerce Commission, with eight years' subsequent experience to guide it, is now trying to do.

The appearance of the United States Census, and the familiarity of the officials of the different roads with some of its leading requirements, enabled Henry V. Poor, in 1882, for the first time to publish certain general statistics of work done. These he has continued to give from year to year, in the face of a good deal of difficulty. Within two years past the Inter-state Commission has addressed itself to the same work, with facilities, of course, far superior to those of any private individual. Early in 1888 a provisional form was issued for the railroad men to discuss and criticize. After some delay the final or definite form of report was issued in July. The information asked was so detailed that it was impossible to obtain anything like complete statistics during the first year, and the original report of the statistician, Prof. Henry C. Adams, is occupied more with general considerations than with definite or tangible results.

[TO BE CONTINUED.]

Test of a Tangye Direct-Acting Steam Pump.

Some tests made by the Alsatian Society of Steam Users are published in a recent number of the *Revue Industrielle*. The experiments were conducted by Mr. Walter Mennier, Chief Engineer of the Association. It was not found convenient to take diagrams from the steam cylinder of the pump, and the effective horse power was calculated by measuring the amount of water discharged and the height to which it was raised. The steam used by the pump was condensed in a surface condenser, and then drawn off and weighed.

The delivery of the pump, under the most favorable conditions, was less than 50 per cent. of the amount due to the displacement of the pump plunger. The table which follows gives the results of the experiments:

TESTS OF STEAM CONSUMPTION ON A TANGYE BROTHERS DIRECT-ACTING STEAM PUMP.								
Diameter of steam cylinder, 40 in.; diameter of pump plunger, 20 in.; stroke, 9½ in.; number of strokes per minute, 125 to 145.								
Number of Experiment.	1	2	3	4	5	6	7	8
Duration of experiment, seconds.....	2,052	2,018	2,033	2,016	2,323	2,433	2,406	2,335
Steam pressure, pounds, per square inch.....	71	71	71	71	71	57	43	28
Suction-lift, feet.....	18.3	17.6	17.6	17.6	17.3	17.4	17.5	17.4
Total lift, feet.....	37.7	37	37	37	36.7	36.8	37	37
Amount of water pumped, pounds.....	5,367	5,426	5,302	5,340	5,406	5,348	5,342	5,368
Steam used, pounds.....	109.7	86.9	88.9	88.8	83.6	86	88	88.9
Pounds of steam hourly, per effective horse-power.	107.3	85.9	89	89.2	85.5	86.6	88.5	89.3

Experiments on Non-Conducting Coverings for Steam Pipes.

An account of these experiments, by Mr. Albert Haacke, was recently published in *Engineering*. The testing apparatus consisted of three cast-iron steam pipes, each having an internal diameter of 5 in. and a length of 6 ft. These pipes were connected at one end to the steam pipe of a

boiler, and the other ends drained into pots fitted with glass gauges. The discharge from each of these pots was cooled by passing through a coil surrounded by cold water when drawn off for measurements, so that all loss of condensed steam in the form of vapor was avoided. The steam from the main pipe, before being admitted to the test pipes, passed through a steam-drier which removed any entrained water. The main steam pipe, the steam-drier and all the connections at each end of the test pipes were covered with fossil meal, 1 in. thick, and 1 in. of hair felt and canvas. The external surface of each test pipe was 12.33 sq. ft. Thermometers were placed on all the surfaces and also in the test-room and in the outer air, and were read at frequent intervals. As will be seen by the table which follows, the tests were made at an average pressure of about 60 lbs. per sq. in. above the atmosphere, and show the condensation in an uncovered pipe, the effect of a fossil meal covering, and that of fossil meal supplemented by three layers of hair felt each ¼ in. thick.

These experiments seem to have been conducted with great care and furnish much useful information. A complete summary will be found in the accompanying table:

Date of test.....	May 20, 1889.	June 7, 1889.
Duration of test, hours.....	10	10
Coverings of test-pipes.	No. 1..... (Fossil meal, 1 in. thick, 1½ in. thick.) No. 2..... (Fossil meal, 1 in. thick, and 1½ in. of hair felt.) No. 3..... (Fossil meal, 1 in. thick, and 1½ in. of hair felt.)	Fossil meal, 1 in. thick. Bare. Fossil meal, 1 in. thick, and 1½ in. of hair felt.
Average steam pressure by gauge.	59.5	59.8
Temperature corresponding to this pressure.....	306.8°	307°
Average temperature by thermometers.	External..... 63° Inside, on wall..... 71.7° Between test-pipes..... 76.1°	72.6° 89.2° 83.8°
On covering of main steam pipe.	90.9°	107°
On covering of pipe No. 1.....	134.1°	117.3°
On bare test-pipe No. 1.....	275.6°	278.2°
On covering of pipe No. 3.....	90.2°	103°
Pounds of steam condensed.	By test-pipe No. 1..... 13.445 By test-pipe No. 2..... 81.82 By test-pipe No. 3..... 6.635	10.144 79.144 5.644
Condensation hourly per sq. ft. of external pipe surface, pounds.	By test-pipe No. 1..... 0.109 By test-pipe No. 2..... 0.663 By test-pipe No. 3..... 0.054	0.082 0.642 0.046
Relative Condensation, per cent.	Test-pipe No. 1..... 16.43 Test-pipe No. 2..... 100 Test-pipe No. 3..... 8.18	12.82 100 7.13
Relative saving due to covering, per cent.	Test-pipe No. 1..... 83.57 Test-pipe No. 2..... 0 Test-pipe No. 3..... 91.82	87.18 0 92.87

A Pump with Variable Delivery at Constant Speed.

The *Revue Industrielle* describes and illustrates in a recent issue an ingenious form of pump brought out by Messrs. Rousseau & Balland, of Paris, and designed to admit of varying delivery without change of speed. Briefly described, the pump is made up of two plungers working through separate stuffing boxes in a single pump cylinder, the latter being fitted with a suction and a delivery valve. The plungers are driven by eccentrics mounted on a common driving shaft, one of the eccentrics being fixed and the other permitting of angular variation. To this end the shaft is fitted with a bronze sleeve, on the exterior of which a screw thread is cut engaging with the interior of the movable eccentric. A lever pivoted on the bed plate of the pump has its shorter arm provided with a jaw engaging the threaded sleeve, so that by being moved back and forth it causes the nut to turn in either one direction or the other and with it the movable eccentric. The threaded sleeve, or nut as we may call it, is mounted on the shaft between the two eccentrics, and the pitch of its thread is such that one full sweep of the controlling lever, moving the jaws from one end of the nut to the other longitudinally, will cause the nut and, at the same time, the eccentric which it engages, to make one complete revolution. The function of the pump is easily understood. Let us assume, for example, that the eccentrics are set 180 degrees apart. Then, since the strokes of the plungers are, under that condition, equal and directly opposite in direction, the delivery of the pump will be zero. This becomes quite clear when it is considered that the volume of the pump cylinder remains constant, the increase of volume due to the outgoing plunger being compensated by the reduction of volume brought about by the plunger on the in-stroke. There can, therefore, be no suction. If now, however, we change the angle at which the movable eccentric is set, the displacements of the plungers will no longer counterbalance

each other, and the pump will have a useful effect. It will be understood that the function of the pump is based on the difference between the distances passed through in the same time by the two plungers. The maximum delivery of the pump is, of course, obtained when the eccentrics are set exactly alike. The delivery can, however, be changed at any time, and almost instantly by simply removing the lever referred to above.

*A paper read before the American Statistical Association by Prof. Arthur T. Hadley.
†Massachusetts act of 1846 required returns, but did not involve their compilation. Partial compilation was begun in 1849.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The noticeable feature of the Chicago Tribune's broadside of railroad men's opinions printed last Sunday is the unanimity of the views held by the various officers interviewed. Taking into consideration the reservations which plainly appear between the lines when not expressed in words, it may be said that there is no difference of sentiment whatever, and the extended statements prepared by Messrs. Blanchard and Walker, the essential parts of which are reprinted in another column, may be taken as showing what each one of the gentlemen said. The probable impossibility of organizing railroad trusts is generally recognized. The "railroad question" is certainly now receiving a good share of attention, and the public need not always remain in ignorance concerning it, if it will read. Much of the present distress is certainly owing to the public ignorance of the true relations between the people and the railroads; but it is somewhat doubtful whether enlightenment administered in ten-column doses will have the desired effect. The medicine will not be retained by the stomach. Besides, it might be well for railroad men to be a little freer in acknowledging their share of the responsibility for over-building, over-capitalization, and other causes of present evils. The feeling in the community that railroads are banded together, that present managers and owners are identical in feeling and interest with former owners and projectors, even those of a former generation, is deep-seated and firm, and may as well be recognized and met. It always saves time in a discussion to admit at the outset as many of an opponent's points as possible, and especially all those which it is known will have little or no bearing on the final settlement.

A noticeable thing about the monthly and quarterly reports of the great trans-Mississippi systems as published is the marked decrease in operating expenses. Some of the New York and Boston papers in their financial columns do not hesitate to say that this is because important items are improperly charged to construction account. It is true that many of these roads have in times past been generous in their maintenance of way and equipment, and it would be an easy matter to transfer debatable items from maintenance to construction, and reduce the expenses materially; but we must wait for detailed statements before passing judgment upon this question. We believe, however, that at least a fair share of these reductions will be found to come from savings in operating made possible by heroic cutting down of train and station service, by discharges of shop employés and the like. Whether these savings can be made permanent is doubtful, and it is, unfortunately, not doubtful that some of them are partially offset by certain losses which have the merit (?) of not being visible on the surface just at present, but which are no less certain; but managers generally are content to meet present exigencies by present remedies.

The Work of the Technical Conventions.

Every year, after the conventions of the railroad technical associations have passed we hear expressions of dissatisfaction with the results of those conventions. While the results are undoubtedly valuable, still it is always felt by many that they are not what they should be, and might be. We speak now more particularly of the Master Car Builders' and Master Mechanics' Associations. Criticisms of this same sort are always made of the conventions of the American Society of Civil Engineers and of the Roadmasters, and probably of those of most other similar bodies; but it would hardly be profitable to enter into a general discussion of the inherent shortcomings of conventions in general. Neither shall we speak now of the relations which men outside of the associations of Master Car Builders and Master Mechanics have gradually assumed toward the conventions. This is a matter of taste and policy concerning which much might be said, and concerning which we may have something to say later. We speak now of the technical work done at the conventions. It is said for one thing that few of the committee reports are papers of high and enduring value; that many of them are perfunctory performances, and contain barely enough of original work to make them acceptable, and that some of them are positively discreditable. It is said, further, that the discussions are often prolix and pointless, and that a great deal of the time of the conventions is lost in tedious demonstrations that the speakers have really nothing to say. Finally, as a result of the indifferent work of committees, and of the lack of instructive discussion, ignorance or prejudice or apathy, or all combined, prevent year after year intelligent and decisive action by the conventions on questions that ought to be settled. The men who make these complaints are not merely the habitual grumblers, or those whose axes have not been ground, but among them are some of the most influential and industrious and public-spirited men in the associations. Now, no one who attends the conventions, or who reads carefully the verbatim reports of their transactions, can fail to be impressed with the justice of such criticisms. No one who knows their history can doubt that the associations have done and are all the time doing valuable service, but the return in useful work from the power expended is so small that it is often suggested that the machinery ought to be remodeled.

One plan proposed is to organize a new association of motive power officers. We should suppose that such a step would do more harm than good. It would weaken the older bodies; the new association would lack the standing that the old ones have gradually acquired, and would not have the prestige of careful work already done, while it would be the object of much jealousy.

Another plan, and one that has much in its favor, is to consolidate the two associations. There is great opposition to this idea, and it may not be possible to carry it out at present, but it is well to consider it. Many officers are now members of both associations, and wish to attend the conventions of both. It is often important that they should attend both. As matters now are this means the sacrifice, practically, of two weeks' time. Were there but one convention the business meetings could be concentrated into four or five days in one week, instead of taking three days in the middle of each of two weeks. Many of the discussions are now duplicated in the two conventions, and often by the same men, to the obvious waste of wind and energy. Much of the time spent in traveling could also be saved, and it is safe to say that what now takes two weeks could generally be done in one. There would be a decided saving in expense to all concerned, and the opportunities for meeting men would be increased by the larger attendance at any one convention.

It is true that many members of one association are but indirectly interested in the subjects that come up before the other; but it is also true that all the subjects that come up in a convention of the Master Car Builders are not equally interesting to all the members. For example, while one set of men is anxious to discuss car-heating at much length, another set is comparatively indifferent to that subject, but would like to take part in a thorough discussion on journal boxes. The result is that some one must always spend a good deal of time listening to talk that he does not care about, and feel that his own topic does not get the attention that it deserves. It was suggested at the Saratoga convention that sessions should be held simultaneously in different rooms for the consideration of two or three different subjects. Such an arrangement will probably be made before many years, as the attendance at the conventions increases, and as the field

covered grows larger. In that way the objection to a common convention of motive power and car department officers would be overcome, while many of the advantages of it would remain.

These means of saving time—consolidation of the conventions and division of the sessions—are not brought forward as novel or as the final word on the subject, but they are worth the consideration of those who have the welfare and usefulness of the associations at heart.

The quality of the reports and discussions could be much improved by obvious means which involve no organic change, and to which there can be no objection but that of a very small additional expense. The committee reports might be put into the hands of the secretary a few weeks before the conventions, and advance proofs distributed among the members. In this way those who wish to discuss a subject could come to the meetings well prepared and in many cases they would come with written discussions. Much of repetition, prolixity, and diffuseness would thus be avoided. Many members, if they had a little time to think a subject over beforehand, with the arguments before them in type, would find that they had something definite to say about it. This plan is followed by several of the technical societies, and we know of no objection to it other than the small added cost. It has been objected that it is not desirable that the reports should be published in the newspapers until they are presented at the conventions. As a matter of fact the distribution of advance proofs seldom results in premature publication. Editors who receive them almost invariably respect the request that they should not be published before they are read. We would suggest that it would be well for the executive committees to at least consider this plan if they have not already done so. Nothing would be so effectual in stirring the committees up to careful and thorough work as the certainty that their reports would be well discussed in the conventions.

Loyalty of Employees.

The ideal railroad, as viewed in the operating department, has officers who are fully qualified to perform the duties of their places, treating those under them with justice; who are known by the directors to be fit men, and who are, with the support of the directors, able to make their subordinates feel that the administration will be a stable one; and the evil effects of uncertainty in the minds of employés concerning their future are thereby obviated. The actual railroad, however, except in a few instances, presents a different aspect. Excluding small roads, whose management is in many respects analogous to that of a large farm or manufactory, and where many of the problems of operation do not come up, it may be said that the road whose officers, as a whole, are both able and just, and in addition are secure in their positions, is in the minority. One general manager will be a brilliant executive officer, but it turns out that his efficiency depends upon his having only such helpers as he has been accustomed to; this sort of man frequently goes from one road to another, but he always takes with him a small army of chosen favorites. Another manager steps into a new place readily enough, and accommodates himself to new lieutenants and their ways, but his success in "making things go" is but indifferent. A third will combine the good qualities of both these, but will be headstrong when dealing with the directors. Finally, a road with intelligent and energetic officers all round may fail because these men's hands are tied by ignorant or slow-going directors.

However small or great may be the difference between the actual and the ideal in the prosperity of a railroad or the smoothness of its working, its condition is always largely attributed to the fidelity and efficiency of its servants, high and low. Directors often give expression to this idea in annual reports, and the public prints testify to the fact every day. Loyalty of employés is an important factor, and to ignore its influence is to waste a valuable power. But it is remarked that loyalty often is not properly fostered, and that in many cases it is even repressed; and it is an undoubted fact that the prosperity of many valuable properties is thereby impaired. The contrast between railroad organizations where it is known that all grades of employés have a well-defined status, with those where the opposite is equally evident, is too clear to admit of any other conclusion. Some roads prosper in spite of bad management, and others fail in spite of good; in the majority of cases good management and bad are mixed together so that causes and results are not so clear; but the real connection is nevertheless discernible if the examination is minute enough. We refer now more particularly to the loyalty of the subordinate officers; and

the trouble often comes about through an injudicious change in the president or general manager.

The officers we refer to, the division superintendents, train masters, road masters, officers in the machinery department above the locomotive engineers and below the superintendent of motive power, division freight agents and others of the same general grade, constitute a very important body. On a system like the Pennsylvania or the Erie, with ten or fifteen divisions, they make a numerous company, and their combined energies, rightly directed, can move mountains. The question of loyalty is an important one in the rank and file, as was brought out at time of the strikes last year, but that branch of the subject we will not now take up.

If now, on a road with a force of from 25 to 100 officers of the grades mentioned, a change in ownership occurs, or the general manager leaves, what is likely to occur? What is generally the course of a board of directors who have to choose a general executive officer, or of such an officer when he is chosen? Without intending to injure the property in the least, and even with the best of intentions for its welfare, the first move often will be such as to violently disturb the loyalty of the under officers. With perhaps scarcely any definite notion that "an infusion of new blood" is needed, and without any pretense that that is a reason for their action, directors will choose a manager wholly on his reputation for ability, with hardly any consideration of his acquaintance with the men he is to command or of their probable feeling toward him. He, in turn, takes a similar view, and if he needs a subordinate of any kind, gets the best man he knows of for the place, without regard to how many men, whose special qualifications he does not know, he may be stepping over in his quest for one of his acquaintance. As a matter of course the men he knows come from the same place he himself came from. Sometimes the confidence a manager feels in those he does know, in connection with his natural inclination—inherited from the ancient time, when every stranger was an enemy—to distrust every one whom he does not know, will lead him to create a need for his tested men if none exists naturally. The influence of personal and family considerations in this connection we will omit from the present argument. And the example of a properly-conducted road with enterprising officers is so scarce in this country that this process is by no means so unsuccessful as it deserves to be. Roads which foster the loyalty of their men by recognizing their ability, are often satisfied with such a very moderate degree of ability that the final result is little better than that on the road which secures some smart fellows from other roads and lets them dash ahead without much intimate knowledge of their surroundings. Favoring circumstances come to their aid, and success, if the comparison be not too critical, settles all questions. It is probably inherent in human nature that directors in whom the disposition to "take care of their men" is strong are generally not strong in their appreciation of true merit as tested by severe standards; while on the other hand the single aim to keep men up to a high standard technically may, if constantly followed, tend to destroy the feeling of personal interest in them, and so a useful element in the retention of their loyalty be lost.

But in the long run right principles must be followed. This country will not always be a new one, and competition will compel economy even where its bearings are obscure and require close study. When a new general manager is hired it should not be for the purpose of securing a dozen new under-officers whom he knows to be of the right kind; it should be for the purpose of infusing some of his own energy into the methods of a dozen men already on the road. If these men's acquaintance with their work, added to their skill, is not sufficient to match the skill alone of the other dozen they must be bad indeed. The importance of acquaintance with the men and materials to be used—not in contradistinction to skill, but as an element of it—certainly is apparent so far as train and station service is concerned; and, in fact, it is quite generally agreed that to hire a train master or a division superintendent from another road is pretty sure to be more expensive than to take the best available at home; but the principle holds just the same in the other departments, though perhaps not quite so decidedly. Even if imported men achieve success the fact remains that the principle is wrong. When this manager dies or resigns another change of the same sort is the logical consequence. The right principle is to perfect the teaching of those who have already learned more or less of the rudiments and ground work; not to bring in men heavy at the top, who have much of the detail to learn. Unfortunately, American experience is quite generally believed to have shown that teachableness is not in a congenial

climate in this latitude; that the spirit of progress has crowded it out—is able to get along without it. Originality, push and independence grow wild, as it were, and require no cultivation. But we are rapidly growing out of this fallacy, and it is seen that even American genius must submit to some guidance if it would maintain its good record.

The best men to serve a railroad are those who know its needs. When they have this knowledge one of the best means to make them energetic in using it is enthusiastic interest in the road and its welfare—loyalty to it. Loyalty consists of numerous elements, and its nature will be better appreciated if we compare it with the more familiar loyalty to country. The soldier of the Republic admires his commander, loves his home and its associations, and believes in his nation's high destiny because he has faith in the principles on which it is founded. Moreover, his love for the Stars and Stripes has an intensity which can be accounted for only by assuming that the associations connected with the flag have come to be inseparable from its combination of colors. A railroad man is actuated by somewhat parallel motives. He has a tinge of hero worship in his administration of his best known superior officer. He will stick to the road he has been on for years largely because his co-workers are friends instead of strangers; this is love of home. He will faithfully work for the interests of the road because of his simple desire to do right—to give an adequate return for the pay he receives. And he will even have a feeling akin to the patriot's love for the national emblem. No doubt there are many employés on the Pennsylvania road to whom "P. R. R." in its various familiar forms has a meaning far different from that with which it appeals to the ordinary citizen of Trenton or Harrisburg, and one which would have its effect in restraining the employé from taking service on the Vancouver, Klickitat & Yakima, for instance, even at an advanced salary. Helping men to realize these simple truths, and making it possible for them to act on them, is one of the very best ways to cement their friendship, whether the word be taken in a business sense or a sentimental one. The mistake of the new manager is in thinking that the first of the four elements named is the principal or the only one. It is not.

The Principle of Railroad Extensions.

Under this title the *Commercial and Financial Chronicle* has an excellent article on the position in which the Chicago & Alton now finds itself. After a careful review of the situation the *Chronicle* comes to the conclusion that new extensions not infrequently are absolute necessities, but that there are exceptions, and that the Alton's situation constitutes such an exception. The reasons are that while Omaha is no longer regarded as the dividing line for systems, Kansas City may yet be called so because three important roads extend to that city from the east and stop; because Chicago is yet such a dividing line, and because the Alton, had it been minded to build west from the Missouri River, would have increased the chaotic railroad condition in Kansas, and would very likely have added as much to its expense as to its earning account by so doing.

We do not question that the *Chronicle* makes out a strong case for the Alton, and, considering all the circumstances, we also think that during the past two or three years (the period wherein this building question has pressed upon the Alton's managers) it would have been unwise to alter their ancient policy. But whether that policy should not have been changed years ago is another question. The traffic between Chicago, St. Louis and Kansas City proper will always be large, and the exceptional advantages of the Alton will give it a fair share.

When we leave the question of the policy of the Alton for the last two years and consider the matter of dividing lines and extensions in general, the reasoning of the *Chronicle* is not so clear. What are dividing lines, how made and how continued? Only as self-interests may dictate. The *Chronicle* says that if the Rock Island or any large granger system should suggest building east from Chicago in order to secure seaboard traffic, the idea would be regarded as extreme. So it would, as long as present relations continue, but a single grand consolidation, under the auspices of the Pennsylvania, for instance, of its present lines with some western system, would change the whole situation. Take the section of the Northwest in which St. Paul, Minneapolis and Duluth are representative centres. They have always been considered dividing cities. The Manitoba and the Northern Pacific there meet the roads running south. If a year ago it had been suggested of St. Paul, as now of Chicago, that a line east be secured,

the plan would have been regarded as extreme because not needed to secure traffic; and yet the Northern Pacific's control of the Wisconsin Central was announced soon after.

An interesting matter in this connection is the increasing importance of the long haul in our American traffic, whether upon competition business or that originating locally. With this long-distance traffic come tariffs, which make through rates less than the sum of the locals. Slowly but surely this principle is extending to all sections and past all dividing lines. Undoubtedly, this is for the best interest of both producer and consumer, as it gives manufacturers a wider field and consignees a wider choice. But one of the inevitable effects must be the gradual obliteration of any dividing cities. It is no great matter whether Kansas City has one more line terminating there than has Omaha; the difference between them is one of degree only, not of kind. Neither of them can be called permanent system-dividing points. American experience seems to prove that permanent divisions of this kind will naturally exist only where an ocean too wide to bridge or a swamp too deep to fill up constitutes a barrier which engineering skill cannot overcome; and the only solid artificial barrier is an arbitrary districting such as France has established. But the French system involves a rigid type of governmental control many of whose characteristics are just the ones not liked by those Americans who desire to have the state regulate the railroads; and notwithstanding the troubles which come upon us because the Burlington builds to St. Paul in retaliation for the St. Paul's line to Kansas City, and the hundreds of smaller moves of that kind, our present system will still be preferred. If we are correct in saying that dividing lines between great systems are and must be purely fanciful, and to be disregarded in practice for any reason thought sufficient by aggressive directors, it follows that the Alton's position between three cities must be judged on its merits, without reference to theories, which we may hope will be considered for the benefit of all, but which experience has taught us are not likely to be so considered when any road thinks a point can be gained by building an extension.

The Missouri, Kansas & Texas Complication.

We have received from Mr. H. K. Enos, Vice-President of the Missouri, Kansas & Texas, his pamphlet, containing an open letter on the subject of the seven per cent. mortgage, and the report of the committee appointed by Judge Brewer to consider whether a strict mileage pro-rate between the several divisions of the road was fair. It should be remembered that the present Missouri, Kansas & Texas is patchwork. Different sections have been added from time to time, and the different mortgages are much interlaced. The sevens are on a mortgage constituting a first lien upon the main line from Sedalia to Denison, while the fives and sixes are first liens on the lines in Texas south of Denison. It is conceded by all that the road, as a whole, cannot earn interest upon the whole bonded debt, and any reorganization must be preceded by a scaling of the bonds. But how shall this be done? As yet no agreement has been reached. The holders of the sevens say that their mortgages cover the most valuable part of the line, and that they want their whole principal and interest without reduction. The statement is vigorously denied by the holders of the southern bonds.

The same question came up in the application of the net earnings to the improvement of the property. This opportunity to withhold the fixed charges for a while and put them into the roadbed and equipment was one of the reasons for the receivership. But the old matter again arose. The sevens claimed that as their division earned about 80 per cent. of the charges, their division should have the benefit of the greater part of the improvements. This percentage was based upon the auditor's reports of earnings, which were, by order of the Court, divided between north and south divisions on strict mileage. The fives and sixes got Judge Brewer to order an investigation into the fairness of this division, and the Court appointed Traffic Manager Waldo, Auditor Pollock and Counsel Hagerman as such committee. Their report is printed in the pamphlet referred to. Speaking of the division of gross earnings, the committee says that if it were possible to ascertain the actual cash value of the different divisions, that would give the fairest method of dividing the earnings, but this is impracticable. Another way is to divide the gross earnings by the aggregate mileage, and then multiply by the mileage of the respective divisions. This is the plan adopted in Poor's Manual, but is not fair in the present case. Constructive mileage is the method favored, and, because of the existing conditions, the southern division should be allowed one and a half miles for one mile of the northern. This goes back to the old Gault-Tucker award, and is undoubtedly fair.

Vice-President Enos presents these points very forcibly. The miles north of Denison, 730, are covered by \$18,000,000 of sevens, the miles south, 881, are covered by \$28,000,000 of fives and sixes. The proportion of one and a half to one would give the southern division approximately 50 per cent. of the net earnings of the system. The plan advocated by Mr. Enos is, to let the sevens foreclose and take their road if they will not consent to any reduction. The southern di-

vision owners will then assess the stock and build the 250 miles from Denison across the Indian Territory to Coffeyville, where the road would join the Kansas City & Pacific, lately acquired by friends, by which an outlet would be obtained to Kansas City.

It would be a misfortune to have the system thus broken up and one more competing line built into Texas where there are already too many, and a compromise of some kind we hope will be reached. As to the relative value of the divisions and of the different bonds, no definite opinion is possible, since it is a matter of judgment merely.

The wide-spread destruction caused during the present season by floods and winds has, as usual, called out the "oldest inhabitant" with his statement that the season has been more disastrous than was ever known. This is true to a certain extent; but the reasons are plain, and if the loss of life and property shall open the eyes of municipal and other authorities, the costly experience of the last few months may be useful in securing additional safety for the future. Every year disastrous storms occur; and year by year dams are growing weaker, sewers are deteriorating, and wilderness gives place to civilization. On an average, the rainfall and wind do not differ materially from year to year, but the conditions of the land devastated by the storms are continually varying. As an example, it is probable that the city of Newark, N. J., has experienced rainfalls quite as heavy as that which occurred last Tuesday, with material damage; but on this occasion many of the sewers burst, flooding the districts in which they were located. A careful supervision of the sewers would have prevented this disaster. Again, few dams are built which are not safe when first constructed; but this condition of things will not continue unless they are thoroughly examined and repaired from time to time. There is scarcely a case of a bursted dam on record in which numerous premonitory symptoms of the dangerous conditions were not given in ample time; and when it becomes true that "forewarned is fore-armed," the list of terrible disasters by storm and flood will be materially diminished. Washouts on railroads have been reported during the past fortnight from many different sections, and the individual cases could be counted by the score if not by the hundred. These accidents are expensive and troublesome and in many cases dangerous; but, in comparing them with the "good old times," when there were fewer such incidents, the increase in railroad mileage and in population should be borne in mind. Many of the roads now suffering were a few years ago "part and parcel of the howling wilderness," and the people now inconvenienced by the washouts were somewhere else. Sixty-five million newspaper readers must have a larger quantity of thrilling dispatches with their daily morning meal than sufficed for a smaller number in former times.

The Michigan law regulating passenger fares, referred to in the *Railroad Gazette* of July 19, page 483, will probably have a decided effect on the revenues of several of the important roads in the state, notwithstanding the apparently innocent character of its provisions. It will be remembered that the bill was bandied back and forth between the two Houses of the Legislature a number of times, and that the Senate recalled it from the Governor, but in its final form it was made to apply to all companies organized under the general railroad law, whose passenger earnings for 1888 reached a certain limit. The two principal roads, the Michigan Central and the Lake Shore & Michigan Southern each earn more than \$3,000 per mile per year on passengers, and they would therefore be required to reduce all the fares to 2 cents a mile; but they are organized by special charters, and therefore apparently are exempt from this law. The Chicago & Grand Trunk, however, is subject to the law, and its earnings are such that it will have to put in effect the 2-cent rate. The roads of the second class, whose passenger earnings for 1888 equal \$2,000 a mile and less than \$3,000 are the Toledo, Canada Southern & Detroit (a part of the Canada Southern), and the Detroit & Toledo division of the Lake Shore & Michigan Southern. The Detroit, Grand Haven & Milwaukee would by its earnings be placed in this class, but that company is organized under special charter and is therefore in the same situation as the Michigan Central. The competition of the Chicago & Grand Trunk with these other roads probably influences their rates to a considerable extent and thus will spread the effect of the law over a large territory. The average train load and the revenue per passenger train mile in Michigan are by no means high and a serious abridgement of facilities is quite likely to follow this radical action. The spectacle of reduced train service in Iowa seems to have had no effect on the mind of the Michigan legislator.

Twelve Chinese on the way from Havana, Cuba, to Hong-Kong were detained by the Collector at New Orleans on July 18 on the ground that the Chinese exclusion act forbade their admission to or their passage through this country; but on the application of the Southern Pacific, which was to transport the men from New Orleans to San Francisco, the Treasury Department finally authorized the Collector to allow the passengers to "proceed in a bonded car." It will be remembered that the lines between Chicago and New York, whose trains run through Canada, lost some Chinese business not long ago because it was decided that if the passengers once went out of the United States the customs officers would not feel at liberty to readmit them. It appears, however, that the New Orleans decision was based on the fact, which clearly appeared, that the Chinese were on their way home. Whether these people are to be sealed up in a car (hermetically or otherwise), as is ordinarily done

under the regulations for bonded transportation, does not appear, nor does the Treasury Department give any indication whether the encouragement of live stock transportation under such unusual restrictions is to be a feature of its permanent policy.

The dispatches from Washington in some of the papers last Saturday stated that the Treasury Department was about to enforce the decision concerning the imposition of a duty on Canadian cars which had been prepared a few weeks ago by the Solicitor of the Treasury Department; but the prediction does not seem to have been verified by the outcome, as no official announcement has been made. The dispatches were apparently inspired by political considerations. The opinion of the solicitor was to the effect that cars which the railroad company should guarantee to return empty might come in free of duty, and to the average politician this rule would probably seem eminently fair; but, as every practical man knows, a rule of that sort would have the effect of suspending all traffic in Canadian cars, as railroads know enough about the expensiveness of hauling empty cars not to do any such work unless they are obliged to. And if Canada should retaliate by a similar rule concerning American cars the shipments of freight across the line without reloading would be practically stopped, at least so far as concerns that which could take American lines readily.

The Pennsylvania allows holders of limited tickets to stop over for an unlimited time at Cresson, in the Allegheny Mountains, where the company owns or is interested in a summer hotel, and the Chesapeake & Ohio has taken similar action in favor of White Sulphur Springs, Va. The scalping of limited tickets has generally been most troublesome at coupon terminals, as at Buffalo, Pittsburgh, etc., and the action of these roads will probably have no bad effect on competitive business, as between rival roads, so long as each line can muster up some kind of a "resort" which can be recommended to passengers as a good place to spend money. But that unfairness, real or alleged, as between rival hotels on the same route will soon be made the pretext for a "kick" somewhere seems self-evident.

In our report of the Convention of the American Society of Civil Engineers, we published the resolutions adopted to have a committee appointed to consider the matter of revision of the constitution of the Society. The resolutions are reprinted on another page, with the name and address of the chairman, to whom any suggestions on the subject should be made without delay. The matter is one of much importance to the Society and to the profession. We have so lately discussed this subject that we will say no more now than to call attention to the chairman's circular.

The "Railway Shareholders' Association," whose complaint before the Inter-state Commerce Commission was noted in the *Railroad Gazette* of July 19, seems to be practically a myth, inquiries as to its status and identity being unsuccessful. The person who made the complaint and who signed himself as President seems to have no definite interest in or connection with any bona fide railroad interests, his reputation in railroad circles depending chiefly upon what is known of him in connection with applications for passes and for remuneration for "influence."

TRADE CATALOGUES.

The Worthington High Duty Pumping Engine at the Universal Exposition of 1889. 4to., pp. 76.

This handsome pamphlet, written in English and French, contains illustrations of the new type of Worthington pumping engines, with descriptions, records of performance and list of installations. It is accompanied by a plan of the exhibition buildings and grounds, showing 23 Worthington pumps on exhibition; and it is stated that the pumping engines already erected and under contract have a capacity of about 1,713,500 gallons per day of 24 hours, the first Worthington duplex pumping engine having been erected in 1860.

The nature of the improvement, which renders it possible to use any desired ratio of expansion in the steam cylinders of a direct-acting pumping engine, and at the same time transform the variable effective pressure upon steam pistons into uniform pressure slightly exceeding that in the pump mains, consists of compensating cylinders with pistons actuated by the main piston-rods, these compensating cylinders oscillating about fixed centres and being in communication with the water main. In each stroke of the main pistons, these compensating cylinders, by the resistance exerted on their pistons, due to the water pressure, absorb power during the first half of the stroke and give it out during the second half, thus diminishing the effective steam pressure at first, and then increasing it. The resistance exerted by the pistons of the compensating cylinders is greatest at the commencement of the stroke, and diminishes to zero at half-stroke, increasing in the same proportion to the maximum at the end of the stroke. By properly proportioning the areas of the compensating cylinders, their action equalizes the effective steam pressure perfectly, and forms a regulator to control the pumping engine under changes of pressure in the main, stopping the engine should this pressure be reduced to zero by the bursting of a main. By means of this attachment, it is stated that the "duty" of the Worthington pumping engine has been raised from about 60,000,000 foot-pounds, attained by the former well-known type, to figures comparing favorably with those obtained from any form of pumping engine.

The Chicago & Northwestern Report.

The Chicago & Northwestern report for the year ending June 30, 1889, is out. Only 39.63 miles have been added during the year, being two branch lines previously undertaken, principally the Iron Range Railroad, 33.63 miles, extending from Ishpeming to several important iron mines in Michigan. This is the smallest annual increase for 12 years. The miles operated increased 66 miles, from 4,177.96 to 4,243.96. Some comparative statements are as follows:

	Gross Earnings.	Operating Exp.
1889.....	\$25,692,258.81	\$15,325,650.25
1888.....	25,677,558.63	15,915,037.23
Decrease.....	\$1,005,299.82	\$589,406.98
	Net Earnings.	Taxes.
1889.....	\$10,368,608.56	\$701,637.08
1888.....	10,782,501.40	755,741.99
Decrease.....	\$415,892.84	\$54,104.91
	Interest on Bonds.	Available for Dividend.
1889.....	\$5,540,456.12	\$4,066,515.36
1888.....	5,215,155.26	4,753,693.45
Increase.....	\$325,300.86	Dec. \$687,088.09

Dividends were the same as last year, \$3,444,504, being 6 per cent. upon the common and 7 per cent. upon the preferred stock, the resulting surplus for 1889 being \$622,011.36 as compared with \$1,309,090.45. Of this decrease in gross earnings, most of the comparative loss came from receipts of freight, which decreased \$925,151.59; the loss from passengers being \$18,343.87. There was a loss of \$382.25 from express receipts, and a gain in mail earnings of \$21,507.19. Receipts from miscellaneous sources decreased \$82,929.30. Analysis shows that by far the largest proportions of the loss occurred upon the Iowa and Galena divisions, which carry in addition to their local traffic a share of the trans-continental and Western business of the Union and Central Pacific roads, and have also the long haul east and west of the trans-Missouri lines in Nebraska and Wyoming. The loss of gross revenue on these divisions was \$850,919.48. On the Dakota, Winona & St. Peter and Madison divisions the decrease amounted to \$481,541.46, which reflects in part the light wheat crop of last season in Minnesota and Dakota. On the Wisconsin and Peninsula divisions there was a comparative gain of \$327,161.12. The net increase of the funded debt was \$1,688,000, mostly for construction on the trans-Missouri lines. Construction account was charged \$696,532 for right of way, side tracks, etc.; \$179,836.38 for second main track; \$316,404.73 for new roads; \$49,610.03 for real estate and \$1,208,218 for additional equipment. The decrease in operating expenses was in part \$163,723.14 for repairs of freight cars; \$119,433.40 for engineers and firemen and \$130,808.24 for fuel. The total number of miles run by freight trains decreased 9.05 per cent. The number of tons moved increased from 10,912,315 to 11,154,715, but ton mileage decreased from 1,939,044,102 to 1,804,701,696. The total mileage of passenger cars increased 1,487,586 and that of freight cars decreased 12,882,265 miles. The total mileage of engines was less by 2,205,272 miles than the previous year. The average freight train load increased from 132.75 to 135.78 tons; the average haul was 161.79 miles, a reduction of 8.95 per cent.; the rate per ton per mile (excluding company's freight) was 1.03 cents in '89 and 1.02 cents in '88, the result being an increase of 4 cents in the average earnings per freight train mile. The number of passengers carried increased 678,543 and the average per train mile increased 3.45 per cent.; but the number of passenger cars hauled decreased 26 per cent., so that the average earnings per passenger train mile increased 1.82 per cent., and the net earnings 3.70 per cent. The total passenger train mileage decreased 1.03 per cent., and the average rate per passenger per mile from 2.30 to 2.24 cents. The miles run to a pound of coal increased from 26.18 to 27.04. The equipment was increased by 20 new locomotives, 35 passenger cars, 24 cabooses, 1,308 freight, 100 gondola, 50 iron ore cars and 2 rotary steam snow plows. Twelve locomotives were rebuilt and 499 overhauled, as were 5 passenger and 119 freight cars.

The trans-Missouri lines show an increase of 82.01 miles and of \$343,589.75 in gross earnings, and of \$326,792.67 in operating expenses and fixed charges, leaving \$122,996.57 for the year, a gain to the parent road of \$16,797 over 1888.

Hydraulic Forging Machines and Steam Hammers.

The following extracts from a paper by Prof. Coleman Sellers, E. D., arranged from notes of lectures on "Engineering Practice," delivered before the senior class of the Stevens Institute of Technology, are useful to designers of machinery and of interest to the general reader. The information here made available is not easily found when one is pushing forward a design of a squeezer or light forging machine, and finds it necessary to know the pressure per square inch which will mold into shape iron and steel at various degrees of heat. We reprint the paper from the *Stevens Indicator*:

Most of the inventions which have contributed in a marked degree to the advance of those arts which have rendered modern civilization possible have been the result of successive demands for the means of supplying ever-increasing requirements. This has been true in a conspicuous manner as regards those inventions which relate to the forging of metals. As long as the requirements of civilization were confined, in this direction, to the making of weapons, armor, agricultural implements and hand tools, the hammer in the hands of the stalwart smith was able to accomplish all that was demanded. When the development of the steam engine and other machines called for forgings of a size beyond the capacity of a single man, the need was first met by calling together from the other fires of a smith shop many men to concentrate their work upon a single forging. These men, timed by the master workman, dealt their blows

in rythmical sequence upon the place indicated by the "master stroke" of the light hammer of the smith who directed the work. Four, five, or even six men can stand about one anvil and deliver blows in concert with the stroke of the master workman, but when still greater force was required, as in forging anchors, as many as eighteen men used to walk in procession to and from the anvil, each striking and retiring, all blows timed so accurately as to seem like a metal hail on the glowing iron. The sound of those quickly recurring blows following the light tap of the master is now seldom heard in well-equipped establishments, though one need not be very old to remember the substitution, by the spade makers and others, of the tilt-hammer for the sledge wielded by strong arms.

The first response to the call for greater efficiency, and the capacity to deal with larger masses of metal, was perhaps given in the tilt-hammer. Next came the trip-hammer and then the helve-hammer. The inability of any of these hammers to forge such shafts as were called for in later constructions suggested to Mr. James Nasmyth what is now known as the Nasmyth hammer. Little by little the "hammer-tup" lifted by steam (acting directly below a piston and exhausting to let it fall) grew from a few tons weight to the monstrous mass which we find at Le Creusot, France, where a weight of 100 tons, falling from a height of 16 feet above the anvil, crushes into shape the heavy armor plates and immense forgings used in the French marine service.

For a time the steam or other direct-acting power hammers seemed sufficient for all requirements, but in time it came to be noticed that a light hammer falling through a long distance did not compress the metal as uniformly as a heavier one falling for a less distance, even when the dynamical momentum was the same in both cases. In fact, experience demonstrated that to forge a shaft four feet in diameter (which is not an unusual mass in the forging of large guns) the hammer should weigh about 90 tons. The rule is that the weight of the hammer in pounds should be 80 times the square of the diameter of the shaft in inches.

The use of hammers of such enormous weights, however, carries with it other undesirable consequences. To oppose adequate resistance to, and to take up the shock of such a blow, the anvil must have a weight of from 5 to 10 times that of the hammer, in the case of forging steel. This enormous anvil must also have an appropriate foundation, and even then the shock of such a blow as is delivered by a 100 ton hammer falling 12 to 16 ft. causes the ground to shake so as to disturb surrounding structures and machinery.

Not many years ago Sir Joseph Whitworth, having occasion to forge masses of steel even more than 4 ft. in diameter, decided to do the work by hydraulic pressure rather than hammer it in the usual way.

*** Resting on sufficient foundations was a massive bed plate, upon which the bottom die was placed, thus representing the anvil face of a steam hammer. From the bed plate four large steel cylindrical columns, each threaded on their upper end, carried a cross-head in which was not only the hydraulic cylinder that actuated the forging ram to which the upper die was attached, but also two small cylinders operated by water from an accumulator, the object of these cylinders being to retract the ram and force out the water used in causing the descent of the ram. By means of the four powerful screws, serving as columns and uniting the cross-head to the base-plate, the cross-head could be raised or lowered mechanically, and thus made to follow the work. This permitted a cylinder of short stroke, serving as the forging power, to be operated at any required distance from the lower die, and to adapt itself readily to the dimension of the metal to be forged.

In this self-contained machine the strain or forging becomes a tensile strain on the columns of the press. In point of fact, the machine is like a coining press, the forging being done between dies. There are attached to the machine indicators that show the amount of motion, and many of the functions of the machine are automatic. There are also other hydraulic cylinders so placed as to handle the work, to act as lifting cranes, as rams to force the work to and from the press as it is extended during forging, and cylinders to cause shafts to be rotated by a ratchet motion that enables the long shafts to be drawn out by a continuous action.

In the steam hammer the same amount of steam is required to lift the "tup," no matter what blow may be required, the difference only being in the height of lift. The force of the blow is not so well under control as is the force of the press, but the greatest good, and also the greatest evil, comes from the press being able to hold its pressure or continue its work farther than the hammer. I will presently show how five blows of a hammer were required to mash one mass of lead to a certain thickness, and a press could do the same work without stopping. While this, in many cases, is a good feature, it can be the source of evil, for the reduction of metal in forging must be done by a succession of actions to insure the ultimate form required when the metal is not confined by fixed dies acting as molds. The forging press must simulate the action of the hammer in its want of continuity; but inasmuch as its action is comparatively slow, the pressure is felt to an equal amount in all parts of the metal subjected to the pressure.

In the hydraulic forging machine time is given for the metal to flow under pressure. This is compatible, too, with quite rapid succession of strokes, for there is no time lost in lifting the weight as in the steam hammer. In the press the dies open only as wide as the nature of work being done calls for, and then proceed under pressure as far as the pressure dare be carried. Our knowledge of the requirements of hydraulic forging has grown with our use of such pressure on a smaller scale, in the forging machines used to strike work in dies, as in forging links for bridge work, in forging car wheels and other simple or even complex forgings where the metal is made by pressure to flow into and fill molds of the required form of the finished article. This forging in dies differs much from forging between the dies in successive blows, after the manner of the steam hammer, but we learn in the use of such machines the requirements as to size of pipes and the manner of working pumps under high pressures.

It was very soon found that to make steel flow into and fill a metal mold, and to fill it perfectly, a pressure of at least 16,000 lbs. per sq. in. must be provided on the ram that enters the mold and drives the metal before it; or, in other words, a pressure of 16,000 lbs. per sq. in. in the die. If the area of the head of a rivet driven by hydraulic pressure and made to fill the cup-head of the die be measured, it will be found that the pressure to do good work is from 12,000 to 16,000 lbs. per sq. in.

It then became advisable to find out if metal unrestrained by confining sides or walls requires the same amount of pressure to deform it. We had reason to think it did not require nearly so much pressure, for the reason that from the first pressure to fill the die a flow had been established long before the high pressure had been applied. Unfortunately, the comparison of the action of the steam hammer and the forging press has as yet not been carried to the fullest extent that such an investigation might be extended.

The amount of pressure required to deform steel in forging the ingots and getting them ready for the tire machines that afterwards convert the ingot into the bands for the out-

side of the locomotive drivers or for the wheels under the palace cars, called for few experiments that will give you a hint as to what can be done by a blow as compared to what can be done by pressure. For the want of hydraulic forging machines acting quickly the experiment could not be made with hot metal. It has been shown in some experiments that lead, as usually sold in the pig, is about equal in resistance to steel at a bright yellow heat. That is about the greatest heat it can be raised to in forging, without injury to the metal from causing it to resume its condition when melted.

A number of billets of lead were cast from the same pig, each 3 in. in diam. and 3 3/4 in. long, and I submit below two tables which will show the effect of a number of hammer blows and the pressure required in a hydraulic press to deform other similar pieces to the same extent as had resulted from each blow.

EXPERIMENT WITH STEAM HAMMER ON INGOTS OF LEAD.
Diameter, 3-in.; length, 3 3/4 in.; weight, 3 lbs. Contents, 30.73 cu. in.

No. of blows.	Length of billet in inches.	Mean diameter of the billet in inches.	Stroke of hammer in inches.	Inch pounds developed.	Pressure per square inch of billet.
1	2 1/4	3.64	19	156,180	20,553
2	1 3/4	4.38	20 1/2	161,317	20,792
3	1 1/2	5.22	20 3/4	164,600	20,792
4	1 1/4	5.93	20 3/4	166,455	31,501
5	1 1/2	6.50	20 3/4	167,482	44,362

COMPRESSION OF SIMILAR BILLETS IN A WHEEL PRESS TO SHOW THE ACTION OF HYDRAULIC PRESSURE IN MAKING THE SAME DEFORMATION AS EACH HAMMER BLOW HAD PRODUCED.

Length of billet in inches.	Sectional area.	Gauge pressure in pounds per square inch.	Total pressure in pounds.	Mean diameter of the billet in inches.	Pressure per square inch of billet.
2 1/4	10.8	1,000	63,617	3.71	5,890
1 3/4	15.71	1,600	101,787	4.47	6,415
1 1/2	21.6	2,500	150,012	5.25	7,383
1 1/4	28.8	4,100	290,520	6.06	8,956
1 1/2	34.56	5,000	318,085	6.63	9,200

The above tabulated result of the hammer blows on lead billets shows the calculated force of the blow worked out on data obtained by other experiments, and the power is expressed in inch-pounds as well as the pressure per square inch on the billet at the end of the blow. These figures cannot be absolutely correct, but they are quite within the bounds of truth, and allowance has been made for errors. It will be noted that it took five blows to reduce the billet to the final thickness of 1/2 in.; when the last blow was over 20 in. long the inch-pounds developed were 167,482, and the pressure per square inch on the billet was 44,362 lbs. Under the press it was possible to make the same amount of compression (or "deformation" as it was called) by one continuous operation. The operation, which might have been continuous, however, was interrupted at intervals to note the pressure at the periods equivalent to the result of each hammer blow. As the billet extended and presented greater area to the plunger or ram of the press and the disk of metal became thinner, the pressure required increased on account of the frictional resistance being greater in the thin disk. In no case, however, does the pressure per square inch on the billet reach one-third of the calculated result of the hammer blows. This experiment confirmed what was understood to be the case, that it certainly takes less than one-third of the pressure to forge by compression between dies of that which is required under the steam hammer. This was also confirmed by some experiments made with closed dies, like molds, in which hot steel and iron were submitted to pressure to cause it to fill the mold. It was found that 6,000 lbs. per square inch caused the metal to flow and almost fill the mold, but that nearly 16,000 lbs. was wanted to insure the sharp corners being quite filled.

We have in the forging press a machine that can work as rapidly as the hammer in every case, and in many cases more rapidly. In such operations as the compression of ingots for tire making, the rapid compression at one stroke may be permitted, an effect being obtained impossible with the hammer.

The slow motion of the hydraulic forging machine as compared to the shock of the hammer is conducive to durability. Hammers will wear out or break in time, no matter how well they are constructed. The forging press is a self-contained, durable machine. In the few attempts to make even small steam hammers self-contained they soon gave out for want of elasticity. As an illustration of this want of durability of machines that have to bear the fatigue of blows, I may remark that a noted iron master told me that he had been much disappointed at the failure of the piston rod of a steam hammer and that the metal after fracture showing very decided want of work in forging. He replaced the broken part by a new forging, selected the iron with care, and had the work well done, but the new piece lasted no longer than the one he had found fault with, if indeed it even lasted as long. At Diston's saw works I have been shown hand hammers used in straightening saws that have broken close to the face from the effect of repeated blows. The forging press, working rapidly, is subjected to no violent shock and can be perfectly self-contained and bound together under a strain greater than the highest power of the press and, therefore, be unyielding during work. Heavy foundations are not required and there is no massive anvil block required to take up the force of blows.

TECHNICAL.

Locomotive Building.

The Rhode Island Locomotive Works is building 10 passenger engines for the Fitchburg road.

The Old Colony is building four 18 by 24 in. standard engines, of the same pattern as No. 132, illustrated in the *Railroad Gazette*, Feb. 25, 1887.

The Pittsburgh & Western has recently received seven new 52-ton 10-wheel engines from the Pittsburgh Locomotive Works. This shop is reported to be now engaged on an order for twenty-five 8-wheel locomotives for the Trans-Ohio Division of the Baltimore & Ohio.

Car Notes.

The Pullman Car Co. has recently completed 25 freight cars for the Astoria & South Coast road, five being of 20 tons capacity and 20 of 25 tons capacity. The company is now building five platform cars for this road.

W. E. Losee, of Victoria, B. C., has completed his contract with the Union mines of that province for the construction of 50 freight cars. They were built after a model sent out from Pennsylvania.

The employes of the Baltimore & Ohio shops at Baltimore have been put on eight hours per day.

The South Baltimore Car Works have just completed a private car for the use of ex-Senator Henry G. Davis, President of the West Virginia Central road, which is very handsome in design and finish. The parlor or observation room is at one end, and is furnished with sofas and large comfortable chairs; next to this are the state-rooms, and at the other end of the car is the kitchen, supplied with a cooking range, with tanks and ample dish closets. The interior of the car is finished in mahogany, the carpets and other upholstery being of olive shade; the hangings are very rich and tasteful. The car is supplied with all conveniences, such as hot and cold water, electric bells, and is equipped with the Westinghouse air brake and air whistle signal, and with Janney couplers. The South Baltimore Car Works being busy on freight car work, the car was taken to the Mt. Clare shops of the Baltimore & Ohio to be fitted out. It has been taken to Deer Park, Md., and Mr. Davis will shortly make a trip in company with President Harrison and several cabinet officers.

It is announced that the capital stock of the Alabama Car Works, \$100,000, has been all subscribed and that the work on the buildings will commence at once. Over 27 acres of land have been secured at South Aniston for the buildings, and it is expected that the company will be ready to accept orders next November. The following directors and officers have been elected: Henry Horn, W. G. Ledbetter, D. F. Constantine, D. C. Cooper, E. M. Lewis, E. G. Roberts and R. F. Thomason. The board of directors then elected G. Ledbetter, President; Henry Horn, Vice President and General Manager; H. D. Clark, Secretary; and E. G. Robert, Treasurer.

Bridge Notes.

The City Engineer of Topeka, Kan., has been instructed to prepare plans and specifications for a steel arch bridge over the Kansas River at that point.

The county commissioners of Hamilton County, O., invite plans and proposals until Aug. 24, for the construction of the substructure and superstructure of a steel arch bridge over Mill Creek, at Colerain avenue, Cincinnati. The commissioners will also receive proposals until Aug. 24 for the erection of a wrought iron bridge at Addyston, in Miami Town ship.

H. G. Moorman, of Mayfield, Ky., Commissioner, will receive proposals until Aug. 10, for building a combination wood and iron bridge across Clark's River, in Graves County, Ky. The bridge will be 300 ft. long and 16 ft. wide.

Work has been commenced on the stone piers for the Memphis & Charleston bridge across the Tennessee River at Florence, Ala. There will be a draw about 412 ft. long. It is not expected that the work can be completed within a year.

A new iron bridge, to cost about \$5,575, is to be erected at Claremont, N. H., to replace the present wooden structure.

The county commissioners of Howard and Prince George counties, Md., have awarded Cofredo & Saylor, of Pottsville, Pa., the contract for building an iron bridge over the Patuxent River for \$5,170.

The Columbus Bridge Co., of Columbus, O., has been awarded the contract for building a three-span Pratt truss iron bridge over the Etowah River at Canton, Ga.

James B. Divers, of Kokuk, Ia., has been awarded a contract for building an iron bridge over Cahokia Creek on Missouri Avenue, East St. Louis, for \$3,400.

Proposals are wanted for the construction of a combination iron bridge across Tallahala Creek on Utica and Dry Grove Road, at Roach Place, near Jackson, Miss.

Dean & Westbrook, of New York, have contracted to build an iron bridge at Farley's Falls, between Erving and Wendell, Mass.

Proposals are wanted, until Aug. 12, for erecting an iron bridge over West Bernard Creek, near Houston, Tex.

The county trustees of Boyd County, Ky., call for bids on 210 ft. combination wood and iron bridge across Catlett's Creek, at Catlettsburg, Ky.

The Knoxville Southern Railroad will soon let the contract for the construction of an iron bridge, with limestone substructure, to cost about \$200,000, over the Tennessee River, at Knoxville, Tenn.

The following bids for constructing an iron pile bridge over Mill Creek, at Fort Monroe, Va., were received by Lieut.-Col. Peter C. Hains, U. S. A., July 25: Groton Bridge and Mfg. Co., Groton, N. Y., \$17,500; Edward L. Dent, Washington, D. C., \$23,883.80; SooySmith & Co., New York, N. Y., \$18,300.

The State Engineer of New York is preparing plans for an iron bridge to be built over the Erie Canal at George street, Rome. The bridge is to cost about \$5,000.

The Boston & Albany Railroad will build a \$16,000 overhead iron bridge near Park's Corner near South Framingham, Mass., and another to cost \$10,000.

The county commissioners have awarded the contract for the erection of the plate girder iron bridge across the Jordan Creek at Gordon street, Allentown, Pa., to the Allentown Rolling Mills. The price is \$13,500. There were six competitors. The bridge is to be 93 1/2 ft. long, and will have one span.

The following bids for constructing an iron or steel bridge across the Kansas River at Fort Riley, Kan., were received July 20: Shaefer & Schniglan, Chicago, Ill., \$21,290; \$20,350; \$20,860, for plans A and B and C, respectively; Milwaukee Bridge & Iron Works, Milwaukee, Wis., \$16,797; \$15,883, for plans A and B, respectively; Clinton Bridge & Iron Co., Clinton, Iowa, \$19,200 for plan A; J. W. Hoover, Kansas City, \$18,000 for plan A; Kansas City Bridge & Iron Co., Kansas City, \$17,984 for plan A; A. J. Tullock, Leavenworth, Kan., \$15,000, \$14,600, \$14,360, for plans A, B and C; George E. King Bridge Co., Des Moines, Ia., \$15,498, \$14,990, for plans A and B; King Iron Bridge Co., Cleveland, O., \$16,000, \$15,500, for plans A and B; Horace A. Keefe & Co., Kansas City, Mo., \$18,242, for plan A.

The Keystone Bridge Co., of Pittsburgh, has been awarded the contract for building the new bridge across the Monongahela River, at Dravosburg, Pa.

The Wrought Iron Bridge Co., of Canton, O., has been awarded the contract for the construction of three iron span and pile bridges at Caledonia, Texas; also an iron bridge at Wheeling, W. Va.

Manufacturing and Business.

Something of the credit for the wonderfully rapid work done in the temporary repairs on the main line of the Pennsylvania after the flood should be given to those who furnished material. The timber for the trestle work from South Fork to Johnstown was furnished by Alexander McClure, of Pittsburgh. In nine days he delivered 52 cars of lumber, mostly heavy timber and long lengths. In measurement it amounted to 640,000 ft.

The plan of subdividing steam power or of transmitting power from the boiler to the work by means of steam pipes in place of belts and shafting is rapidly growing in favor. Westinghouse, Church, Kerr & Co., of New York, are now fitting up the shops of the Long Island Railroad, at East New York, using in place of a single engine three engines of 75, 60 and 25 h. p. respectively.

The Etna Machine Co., of Warren, O., has recently received orders for engines from W. I. Slipper, Mulberry, Ind.; the Standard Iron Co., of Bridgeport, O., also an order for six pipe-threading machines from the Paige Tube Co., Warren, O.

The Baldwin Locomotive Works has subdivided its power, and now has 11 Westinghouse engines, aggregating 854 h. p., in different parts of its extensive works. The recent orders of the Westinghouse Machine Co. have aggregated 27 engines with 3,535 h. p.

The Ball Engine Co., of Erie, Pa., now has orders for 7,165 h. p. of its automatic cut-off high speed engines to build for electric light and electric railroad purposes. The company has just completed the first twelve of 300 h. p. compound engines for the Edison Electric Illuminating Co., of Brooklyn, N. Y.

R. W. Hill, architect, of Boston, is making plans for the Bridgeport Brass Co., of Bridgeport, Conn., for a new casting shop and for the enlargement of the present rolling wire and tubing shops.

G. M. Barbour, F. C. Rutan and others have incorporated the Chicago & Arkansas Railway Construction Co. in Illinois, to build railroads, bridges, etc. The capital stock is \$325,000.

W. S. Collins, 171 Broadway, New York City, licensee for the Aerated Fuel Co.'s system, reports business rapidly increasing. Among recent orders which he has taken for placing the system in shops are those from Fayette R. Plumb, edge tools, Frankford, Pa.; G. & H. Barnett, files, Philadelphia; Benj. Atha & Co., Newark, N. J.; Heller & Bros., files, Newark, N. J.; the Enterprise Mfg. Co., Philadelphia; and the E. P. Gleason Glass Co., Brooklyn, N. Y.

In the *Railroad Gazette* of July 1, 1887, was illustrated Sullivan's improved method of securing the wedge for locomotive driving boxes. This device has been in use on the Northern Central for the past seven years, the right to its use and manufacture having been purchased by the Pennsylvania Railroad, and it is now meeting with substantial success. A number of other railroads are negotiating for the right to use it.

The Mechanical Boiler Cleaner & Manufacturing Co. has been incorporated at Mattoon, Ill., to manufacture and sell the Hornish mechanical boiler cleaner and other mechanical devices; capital stock, \$30,000; incorporators, Frank Kern, Harry M. Dickson and Orin C. Harmany.

The Chicago Bridge & Iron Co. has been incorporated at Chicago to manufacture and sell bridges, trestle work, viaducts and roadways, and do all kinds of construction work; capital stock, \$100,000; incorporators, George H. Wheelock, Horace E. Horton and William B. Wheelock.

The capacity of the large shops of the Ingersoll-Sergeant Rock Drill Co. is tested to its extreme limit. The company has orders at present for 13 air compressors, none of which have been shipped. Orders are also in for channeling machines, rock drills, etc. The Ingersoll-Sergeant Co. has recently received orders for complete plants of machinery for the Aurora mine on the Gozebic range in the Lake Superior district, and for the Santa Fe Copper Co., Santa Fe, N. M.

The Marden Car Brake Co., of Boston, reports sales of 400 beams this week—part for Boston roads, and part for a road in New York.

Iron and Steel.

The Bookwalter Steel & Iron Co., 18 Cortlandt street, New York, owners of the Robert process for the manufacture of steel, have been advised that their exhibit in the Paris Exposition was awarded the highest gold medal and 14,000 francs. John Brown & Co., of Sheffield, have taken a license from the English company controlling the patents for that country and are setting up a plant. The Michigan Steel Works, at Detroit, are now in operation under this process.

The Pennsylvania Construction Co., of Pittsburgh, has received the contract from Raul, McNally & Co. for furnishing for the new building in Chicago 2,500 tons of structural iron.

The Rankin and Fritsch Foundry & Machine Co. is preparing the foundation for a new slotter, which they have ordered from the Niles Tool Works, Hamilton, O. This will add very largely to the company's facilities for heavy work in its machine and erecting shop.

The Illinois Steel Co. is constructing a new blast furnace at Joliet, Ill. It is to be of the largest capacity and smelting capability, and is being erected adjoining the two old ones now in full blast. The new Fox patent-plate mill is well toward completion.

The Nova Scotia Iron, Coal & Railway Co., of New Glasgow, N. S., which was organized last month, will proceed immediately to prospect its iron properties, and if they are found of sufficient capacity the company will commence the erection of a furnace and other necessary plant.

The Linden Steel Works, of Pittsburgh, Pa., has been awarded the contract for furnishing 428 tons of steel plates for the cruiser "Maine," which is being built at the Brooklyn Navy Yard.

The Ewald Iron Co., of Louisville, Ky., has increased the capacity of its works by adding facilities for rolling openheart and other soft-steel plates to meet the growing demand for plates of steel.

The Chicago & Calumet Rolling Mill Co., of Chicago, has been chartered in Illinois to manufacture steel and iron products; the capital, \$1,000,000. The incorporators are Jean L. Pfau, J. Louis Pfau, and George Campbell.

The sub-let work on the engines of the armored cruiser "Maine" has been issued by the Quintards, of New York. The Standard Steel Co. has been awarded the making of all the steel castings for the "Maine's" machinery. The Bethlehem Iron Co. has secured all the work for the shafting and heavy steel forgings. The Linden Steel Co., of Pittsburgh, is making the steel boiler plates and steel blooms for miscellaneous forgings. The Tyler Steel Tube Co., of Boston, has been awarded the making of the steel boiler tubes. The Continental Iron Works, of Brooklyn, is making the corrugated furnaces. The Southwark Foundry & Machine Co. is doing the cylinder work. The South Brooklyn Steam Engine Works are making the condensers.

The Seattle Iron & Steel Mfg. Co., of Seattle, Wash. Terr., has been organized at Seattle, and will soon file articles of incorporation. The capital stock will be placed at \$100,000, and may be increased to \$500,000. The works will be built at Salmon Bay, near Seattle, where the company has purchased 20 acres of land adjoining the Seattle, Lake Shore & Eastern railroad tracks. The company is to manufacture iron and steel. The raw material at first will be obtained from the Ironstone furnaces, but as soon as the Kirkland Co., of which Peter Kirke, of Worthington, England, is the head, commences operations the raw iron for the company will come from the Kirkland furnaces. The architects are already at work on the buildings for the company. The incorporators are: William Hainsworth, William H. Hainsworth, Leigh S. J. Hunt, W. C. Hill, Thos. Ewing, William E. Bailey, John W. Emerson, Bailey Gatzert, Lyman Elmore, T. A. Noble and Robert H. Boyle. Of these most are well known in Seattle. The trustees have chosen officers as follows: President and General Manager, William Hainsworth; Vice-President, Thomas Ewing; Superintendent, T. A. Noble; Secretary and Assistant Manager, William H. Hainsworth.

100 lbs. Rails in Belgium.

In the communication from Mr. Sandberg, published last week, the statement was made that in all 15,000 tons of the Goliath rail, 100 lbs. per yard, have been rolled for the Belgian State Railroads. A letter just received informs us that a further order has been given for 15,000 tons, making in all 30,000 tons. At 100 lbs. per yard this would would lay about 190 miles. We believe that the Belgian section runs a trifle over 100 lbs.

Foreign Technical Notes.

A project is at present on foot to establish a rack railroad on the Abt system in the Crimea, to connect the town of Jalta with the top of Mt. Magabi, 3,000 ft. above the level of the sea, which is to be laid out as a health resort.

Referring to the 335 ft. chimney of the Clark Thread Co., at East Newark, N. J., which, since its completion, has received frequent mention as being the highest boiler furnace chimney in the world, a German paper remarks that in height this chimney is exceeded by one at Croix, near Lille, France, and by another at Rive de Gier, Loire, measuring 334½ and 354 ft., respectively. Attention is again directed to the several Scotch chimneys, which all are higher than the East Newark structure. It may, however, not be amiss to repeat here that these are not furnace chimneys, but serve the purpose of carrying off noxious vapors from chemical works.

Dingler's *Polytechnisches Journal* directs renewed attention to the cold sawing of metals, and emphasizes the various advantages of the process in some workshop manipulations. The use of the hand saw on metals in the cold state, it points out, offers no special difficulties so long as proper speeds and rates of feed are maintained, and the saws are kept in good order. For wrought iron a suitable speed is given as 3½ ft. per second; for cast iron and steel, 2½ ft.; and for brass, 4½ ft. These speeds should be maintained even for varying thicknesses of the work, only the rate of feed being altered. As an efficient substitute, in many cases, for the relatively much more expensive work of forging, the process of cold sawing, our contemporary maintains, is not properly recognized.

The increase in the consumption of naphtha as a fuel on Russian railroads is strikingly shown by some recently published figures. According to these there were used on Russian locomotives in 1881, 125,000 pud of naphtha, as compared with 5,367,000 pud in 1886.

According to an Australian trade journal, a recent foreign patent specifies the use of a central groove running along the working face of a file, into which issue the spaces between the file teeth on each side, the teeth being inclined in opposite directions. The object of this arrangement is to keep the working surfaces clean, the metal filings entering the central groove, from which they readily drop.

The outfit for a submarine telephone line has been furnished by a Brussels firm of electricians. The line is in South America, connecting Buenos Ayres with Montevideo, and it passes through the mouth of the Rio de la Plata for a distance of about 30 miles.

German Tank Locomotive for Heavy Grades and Sharp Curves.

Glaser's Annalen illustrates and describes in its issue of July 1 a compound tank locomotive designed specially for lines with heavy grades and sharp curves.

Great boiler power, adhesion and a long wheel base are among the principal features of the design. There are two sets of two cylinders each, mounted on separate frames, and working four driving axles. The main part of the boiler, with the water tanks on each side, rests on the forward frame, while the back end rests on the second frame, and is so connected with it that in passing around sharp curves or in striking a heavy grade perfect freedom of action is secured. The connection is of the ball and sock type, and is readily adjustable. Safety appliances are arranged to prevent serious accident in case this connection should break. The boiler carries 180 lbs. pressure, and the furnace is adapted to different kinds of coal. The steam is exhausted from the forward, high-pressure cylinders into a receiver, and thence passes into the rear cylinders; but provision is also made for directly admitting steam at boiler pressure into these low pressure cylinders and exhausting from the high-pressure cylinders into the stack. The valve motions for both sets of cylinders are controlled by separate screw gearing. The high-pressure cylinders are 16 in. in diameter, and the low pressure 22½ in., the stroke in both cases being about 25 in. In working condition the engine weighs 113,300 lbs., and when empty, 89,100 lbs., and the total weight is evenly distributed over the four driving axles. There are 21½ sq. ft. of grate surface and a total of 1,365 sq. ft. of heating surface. The extreme length of the engine is 38 ft.

Consumption of Gas in Engines.

Tests recently made in Germany have developed some interesting particulars bearing on the question of gas consumption in gas engines. The tests were instituted because of the general complaints of excessive gas consumption in such engines, and a series of preliminary trials showed that, as a matter of fact the actual consumption in the case of a one horse-power engine exceeded the rated consumption by about 30 per cent. Investigation showed that the gas meter was placed in a room at a temperature of 25 degrees C., with a barometric pressure of 730 mm. Reducing the quantity of gas indicated on the meter to a temperature of 12 degrees C. and a barometric pressure of 760 mm., the quantity was found to agree much closer with the rated figure, showing very strikingly the importance attached to the position of the meter or the temperature of the surrounding air, and the influence which it exerts on the readings. This circumstance is important, not only where gas is used for power purposes, but also in cases of lighting and heating. For the consumer, therefore, it is worth while to select for the meter, if possible, a cool place, taking precautions, however, against frost.

Mustard Oil as a Lubricant.

Mustard oil has of late been given some attention as a lubricant—in fact, it is reported to have been successfully used for some time in Germany for lubricating purposes, being manufactured at Iversgehofen, near Erfurt. It is said not to be susceptible to cold until a temperature of from 9 to 10 deg. C. below zero is reached, and besides does not easily become rancid or form fatty acids which would attack metal. Its lubricating value, moreover, according to Professor G. Hermann, of Aix-la-Chapelle, is of a relatively high order. No particulars have been yet given as to the cost of the new lubricant, its specific gravity, etc.

Perforated Saw Blades.

Perforated blades for band and circular saws are just now attracting attention in Germany, and are apparently giving general satisfaction. Blades of this character, as some of our readers may know, are not entire novelties, but have been known in modified forms for some years. As a general thing, however, their use has been much decried. Still they appear to have some advantages worth considering, and many claims of superiority are made for them. Among them is that of reduced blade friction, due to reduced area of rubbing surface; less tendency to heat, because of the circulation of air through the holes, and economy in power. The holes further prevent the dangerous extension of cracks in the saw blades, and, in general, make it a comparatively easy matter to keep the saws in good running order.

Flexible Metallic Tubing.

Considerable interest was shown at the Brussels Exposition in 1888 in a form of flexible metallic tubing exhibited by the Belgian and Colonial Flexible Metallic Tubing Co., of Brussels, Belgium. The tubing was formed by wrapping strips of metal spirally around a mandrel. The metal strips were bent over at both sides and a thin, narrow rubber band was inserted to prevent leakage. The tubes could be bent in any direction, were perfectly tight, and were claimed to possess great resistance to both internal and external pressures, and to be easily handled and repaired. They were designed to compete with rubber hose in its various applications, and, according to present accounts, have met with a fair share of popularity. The tubing shown at Brussels was of brass and of a wide variety of sizes.

The Life of Steel Rails.

The German Railroad Bureau has recently published the results of experiments made for six years—from 1878 to 1884—in the life of steel rails, in Germany, Hungary, Holland and Belgium.

Comparisons have been made of double and single tracks, with varying curves and grades, and also with different varieties of steel rails on the same track. In some cases the wear was so slight as to be scarcely appreciable.

The following figures show the wear in fractions of an inch per million tons of load passing over the rail:

1. Level track or grades less than ½ per cent.
 - a.—Tangents and curves with radii exceeding 3,300 ft. 0.0016 in.
 - b.—Curves with radii from 1,300 to 3,300 ft. 0.0028 "
 - c.—Curves with radii from 980 to 1,300 ft. 0.0039 "
2. Grades of from ½ to ¾ per cent.
 - a.—Tangents and curves of 3,300 ft. radius, single track, 0.0067 in.
 - b.—Tangents and curves of 3,300 ft. radius, double track, up grade, 0.0032 "
 - c.—Tangents and curves of 3,300 ft. radius, double track, down grade, 0.0043 "
3. Grades of from ¾ to 1 per cent., and curves with radii of from 2,000 to 3,300 ft. 0.0087 in.
4. Grades of from 1½ to 2 per cent., and curves with radii between 650 and 980 ft. 0.0087 in.
5. Grades between 2 and 2½ per cent.
 - a.—Curves with radii between 2,000 and 3,300 ft. 0.0122 in.
 - b.—Curves with radii between 650 and 980 ft. 0.0201 "
 - c.—Curves with radii less than 650 ft. 0.0378 "

According to these figures the average life of the rail would be 35 years, on the supposition that it must be replaced when the wear reaches ½ in. Thus, assuming an annual traffic of 3,430,000 tons, and taking the wear per million tons between 0.0028 and 0.0067 in., the life of the rail is 50 years in the first case and 20 in the second, giving a mean value of 35 years. The traffic of 3,430,000 tons gives a daily average in Germany of 28 passenger trains and 10 freight trains. Of course this calculation is purely theoretical, and neglects some important practical points. Thus it frequently happens that a rail must be replaced, on account of its rough surface, long before the wear has reached ½ in.

Tire Failures in Germany.

According to German statistics recently published there were, in 1888, 4,577 cases of tire breakage on 37 different German railroad lines covering a length of about 23,262 miles. To these were due 26 derailments and 268 train delays. Examination showed that in 1,499 cases fracture was due to poor material; 772 breakages are attributed to low temperature or sudden changes of temperature; in 751 cases brittle material was responsible, and in 1,015 cases the cause of fracture could not be determined. It was shown that the most unfavorable results were recorded with puddled steel; next in order came wrought iron, and finally cast steel, Martin steel and Bessemer steel.

The Erie's New Limited Trains.

The Pullman shops have just delivered to the New York, Lake Erie & Western complete equipment for the New York & Chicago Limited trains Nos. 5 and 8, including baggage and smoking composite cars, day coaches with smoking compartments, sleeping cars and dining cars. The entire train is vestibuled. The day cars are finished with the splendor generally found only in parlor cars, and the cost of each train is given as about \$103,000. The Pintsch lighting system is used throughout. The dining cars are said to be improvements on the best results hitherto attained by Pullman, embracing novelties in form, finish and furniture which tend strongly to substantiate the claim that they are "The finest in the world." They accompany the train the entire distance between New York and Chicago, permitting more freedom to passengers in selecting their hours for meals than would be the case if they were run only a portion of the way.

A New Ferry Boat.

The "City of Reading," built by the Harlan & Hollingsworth Co., of Wilmington, Del., for the Philadelphia & Reading was put in service this week between Chestnut Street Wharf, Philadelphia, and Kaighn's Point, Camden, N. J., forming part of the Philadelphia & Reading route from Philadelphia to Atlantic City, N. J.

The iron hull of the boat has water-tight bulkheads and its strength is such as to enable the boat to cut through heavy ice at the full speed of its engines, thus avoiding delays in winter. The length on deck is 158 ft., beam 55 ft. 6 in. and depth of hold 12 ft. 3 in. The boiler is of the direct tubular pattern, with three furnaces burning anthracite coal; the cylinders are 48 in. in diameter with 10 ft. stroke. An independent or "donkey" boiler is provided to work the fire pumps. On the outside the new boat is painted terra

cotta red, relieved with cream tints and profusely ornamented with gold leaf. The sides of the cabin are lined with highly polished sycamore and cherry, and the ceilings are artistically paneled and frescoed. The cabin windows are unusually large, each being formed of a single sheet of heavy French plate. Above the windows extends a line of transom lights, filled with amber cathedral glass. The seats are divided by bent-wood arm rests, and the electroliers and metal fittings of the cabins are of wrought brass in simple but tasteful designs. The boat has steam heating apparatus and is lighted throughout with electricity, the Edison incandescent system being used. Its carrying capacity is 1,500 passengers and there is space for 18 vehicles. The "City of Reading" is the most magnificently fitted ferry-boat on the Delaware River, and it is expected to prove to be the fastest. Its addition increases the number of boats in this service to six, and will enable the Philadelphia & Reading to meet the demands of its rapidly growing seashore traffic with greater ease.

New Cars for the Richmond & Danville.

Since the commencement of the year the Richmond & Danville has given out contracts for building 2,150 cars. A large number of these have been delivered, and it is expected to have them all delivered by Oct. 1. The contracts were let as follows: To the Pullman Co., 420 box cars; to the Fouth Baltimore Car Co., 560 box and 200 stock cars; to the Tred-ear Co., 300 cars; to the United States Rolling Stock Co., 500 double hopper coal cars, 100 coke and 70 platform cars. All the box and stock cars will be equipped with air brakes and M. C. B. standard couplers, and the open cars will be equipped with M. C. B. couplers. For hundred of the box cars and all the open cars will be of 60,000-lbs. capacity. The balance of the cars will be 40,000-lbs. capacity.

Extending Machine Shops.

The Intercolonial road is about to erect a new round-house and an extension to the machine shops at Moncton, New Brunswick. The new round-house will be similar to the present one, brick and iron roof, with a capacity to accommodate 28 engines. The erecting shop will be 201 ft. long and 110 ft. wide, of brick, iron roof supported by iron trusses.

Improved Pump Valve Seats.

A brief description is given in one of our German exchanges of a simple and effective means of securing tightness of pump valves. The plan followed consists simply in grooving the valve seats and inserting rubber cord in the grooves. The cord, as will be readily understood, is compressed when the valves seat themselves, and effectively guards against leakage. In addition to this it prevents the shocks ordinarily produced by rapid closing, and prolongs the life of the seats. The importance of this will be readily appreciated by those familiar with the working of pumps under high water pressures. The rubber cord, when worn, can be easily and quickly replaced. The arrangement, we are told, is employed with very satisfactory results in a number of German mine pumps, and was first brought out by the Prince Rudolph Iron Works, at Dülmen, Germany.

Large Rolling Mill Output.

The Illinois Steel Co., of Chicago, has succeeded in eclipsing all previous records on a single week's output of steel rails and ingots, as will be seen by the following schedule:

	Ingots.	Rails.
	Tons.	Tons.
Monday, July 22.....	1,358	999
Tuesday, July 23.....	1,196	1,022
Wednesday, July 24.....	1,408	1,149
Thursday, July 25.....	1,309	1,143
Friday, July 26.....	1,295	1,051
Saturday, July 27.....	458	419
Totals.....	7,024	5,783

This is said to be the largest 11-turn product that has been made by any mill in the world. The rails were all 66-lb. except one turn, which was 75-lb., requiring two changes of rolls during the week. The Union Mill, at which this rail was made, has recently been equipped to roll two two-rail blooms at once.—Iron Age.

THE SCRAP HEAP.

Notes.

The Southern Pacific shops at Sacramento discharged 330 men last week, half the number being machinists.

The Indiana Board of Equalization has increased the total assessment of railroad property in the state to \$66,241,532, the total last year being \$64,231,727.

The British House of Commons has passed a bill granting £600,000 for the building of railroads in Ireland, the expenditure of this amount apparently being spread over a number of years.

Division Superintendent E. L. Tyler, of the New Orleans & Northeastern, was last week taken from Louisiana into Mississippi on a requisition from Governor Lowry, of the latter state, and made to give bonds in \$2,000 for his appearance, to be tried for aiding and abetting the late prize fight.

A suit has been entered against the South Fork Fishing Club, of Pittsburgh, for \$50,000 damages for loss of life and property occasioned by the breaking of the South Fork dam above Johnstown May 31. The suit is brought in Pittsburgh by the widow and children of John A. Little of Sewickley, a drummer, who lost his life in the Hurlbut House, Johnstown, by the flood.

A share of stock in the New River Co., an organization which supplies water to a district in London, was sold at auction recently for the modest sum of \$610,000. The first bid for it was £80,000, and the final one, £129,000, was from an insurance company. The company was organized in 1613, and half of the stock originally belonged to King James I. The par value was £100. The share just sold received last year £2,610 in dividends.

A Section Master's Faithfulness.

An exchange prints the following account of a peculiar accident:

"William Dixon, a section foreman on the Oregon Short Line, on July 15, found a rail in the track about six miles west of Soda Springs, Idaho, which was out of line on account of the pressure of the adjoining rails. With one man to help him, he undertook to replace it with a shorter rail. They had removed the spikes from the inner side of the rail, and Dixon took a claw bar to pry the rail out of its place. As soon as the rail was relieved from the pressure of the other rails, it sprung as if it was made of spring steel to a distance of 15 ft., striking Dixon and breaking both of his legs below the knees.

"There he lay, both legs broken, a rail out, a passenger train nearly due, and only one man to help him in his misery and warn trains in time to avert disaster. He ordered his man to get the hand car on the track and help him upon it, and with the broken bones protruding through the flesh, he

started down grade, which at that point is heavy, and with nothing but a shovel to push himself along, he set out for the men on the next section, while he sent his man on foot in the other direction to meet the passenger train. Dixon had to go about three miles, and it was about three hours before he could have his injuries attended to. One leg was then amputated and there was hope of his life and the other leg being saved. Later, however, it became necessary to amputate the other leg and his death followed in three days."

The Petroleum Market.

In an article on this subject the *American Manufacturer*, after noting the fact that the producers were relying less than formerly on speculative efforts to control the price, says: "There has been a healthy export demand which the advance of 30 points within the last four weeks has not restrained. We have regained our market in Europe outside of Great Britain, and there has been no important loss outside of China and Australia. The consumption in India shows a decided increase, as the consumers of Russian oil do not appear satisfied with it."

"In the meantime the wells at Baku constantly require deeper drilling, as they show the same characteristic decline always attending wells in 'gusher' pools. And the Russian Government is discouraging the construction of pipe lines leading to the Black Sea, preferring apparently that their petroleum shall assist in the development of the trans-Caspian region to any profit that might accrue to the Nobles and Rothschilds from the sale to foreign nations; consequently many of the tank steamers formerly employed in conveying Russian are now transporting American petroleum."

The condition of affairs is asserted to be about as good as can be imagined for the trade, and is summed up as follows: At the close of the present month, including surplus and field stock, less than 15,000,000 barrels of Pennsylvania oil will be above ground, as compared with 23,586,951 a year ago, 32,289,269 two years ago, and 34,428,493 in 1883. The control of the entire amount of outstanding certificates, which on last Monday was 9,473,396 barrels, would require, on a 20-cent margin, less than \$2,000,000. The present prospect of production indicates a maximum yield of not more than 65,000 barrels a day, or from 10,000 to 15,000 barrels a day under consumption. Under these conditions there can be no wonder that oil has been spurted to over \$1.

Some of the World's Coal Fields.

In view of the question which has suggested itself on more than one occasion as to how long it would be before the Old World coal deposits would become exhausted, the *German Handels-Museum* supplies some interesting figures relating to the world's coal fields outside of the North American continent. According to these the Low Countries, Switzerland, Denmark, Germany, Bohemia, Siberia and Hanover possess coal mines of a surface area of about 59,000 square miles. Russia alone has 22,000 square miles. The deposits of the island of Formosa amount to something like 10,000 square miles, some of the coal veins ranging up to 96 ft. in thickness. The coal fields of Austria, Spain, Portugal, Italy, Greece, Turkey and Persia cover about 39,000 square miles, those of India 35,000, and those of Japan 6,000 square miles, while those of China are rated at the enormous figure of 400,000 square miles. But these are not all. Falkland, Patagonia and Peru are very rich in coal, while the southern part of Chili is one immense deposit. In Brazil veins varying in thickness from 17 to 25 ft. are found in numbers, and in the United States of Columbia there is an abundance of the mineral. Mexico and the Vancouver Islands are also well supplied, there being probably not far from 20,000 square miles, while the deposits thus far discovered in Tasmania, New Caledonia and Natal are estimated to cover 100,000 square miles, the larger number of these deposits not yet having been worked. Judging from all this there seems to be but little prospect of a coal famine for some years.

Shining Examples.

Henry S. Ives, the youthful railroad wrecker, managed to get out of Ludlow street jail at New York for a few moments the other day on a writ of habeas corpus, but was promptly put back again by the court, which decided it could not interfere. The only complaint to be made here is that this example for all would-be Napoleons of finance is not made half shining enough to work the best results.—Springfield Republican.

Sioux City Stock Yards.

The rare state of things where net earnings are the same as gross is revealed in the follow statement, published by the Boston News Bureau. We have not seen the statement of any railroad company that resembled this:

"Receipts of Union Stock Yards, Sioux City, for the month of June: From yarding hogs, \$4,460; cattle, sheep and horses, \$3,000; income from rents, \$4,000; total gross receipts for June, \$11,460. Expenses are met by proceeds from sale of feed, so that the above are practically the net earnings for June."

Always Take the Safe Side.

The *Railway Service Gazette*, assuming that the poor track which derailed an express train near New Haven, Conn., June 29, was made so by the undue haste with which the section master did his work, has the following to say on "Gambling in Human Life."

"In case of even the remotest doubt, always take the safe side. It is better to risk discharge and loss of position, than to be in all after-life haunted by the memory that through an act of careless human life has been lost. It is not probable that Section Foreman Shields was promoted by an improper motive when he took up a larger number of rails than he could safely replace. But having carelessly done this, he should have taken no further risk. Had he held the train until the rails were securely fastened, he, no doubt correctly, supposed he would be open to censure and possibly loss of position. However, like the desperate gambler, he staked his all and even the lives of others upon another chance—and lost. But suppose he had not lost; suppose the train had passed safely over. What then? Only this difference. He would still, like the gambler, have been more willing to take another chance and another, until at last the inevitable wreck, with its fatalities, came. It is a question if one may, with honor, gamble away money wholly his own. To risk and lose the money of others is a crime under the law, and is everywhere regarded as an act of dishonor. Then how much more dishonorable it is to stake human life upon chances, though the chances seem greatly in your favor. In whatever capacity a man may be connected with the movement of trains, if in one single case he fails to take the safe side when there is a question of danger, that very moment he becomes an unsafe factor in railroad operation. If he escape the consequences of his first hazard, he will take another and another, and he may even at last come to believe that he is especially favored by fortune, and having arrived at this state he is the one least to be trusted, for fortune, as ever fickle, will at last deal him the most cruel hand. Railroad management punishes the man who causes the wreck. It would punish the man who takes the chances and escapes the wreck. The man whose fault causes a wreck involving the loss of human

lives bears with him a heavy punishment through all after life. He will be the last to repeat his folly. The man who takes the chances and escapes a wreck is the one most likely to take the chance again and again, until a wreck is caused. None are favored by fortune. To believe you are is a fallacious and a deceptive idea."

Cable Street Railroads in Portugal.

The eminently satisfactory results which have attended the operation of the first cable street railway in Portugal, which was given over to traffic in 1882, have, to all appearances, encouraged the construction of other similar roads, and a company was accordingly formed in Lisbon some time ago, which obtained concessions for the building of four separate lines. Permission for the construction of only one of these as an experiment has, however, thus far been granted by the municipal authorities, and of this one, opened in 1884, the *Schweizerische Bauzeitung*, of recent date, publishes some interesting particulars, accompanied by a plate of engravings.

The topography of the city of Lisbon, with its heavy street grades, makes the advantages of cable roads all the more prominent. The particular road here considered, for example, though of only very limited length, having an average grade of 23.2 per cent.—surely sufficient to make cable traction most desirable. The cable, as in nearly all surface roads of this type, is placed underground, running in channel iron conduits, and a rack and pinion arrangement is also used for greater safety. The cable rests on horizontal cast-iron rolls, vertical rolls guiding it around the several curves, and composition bearings are used. It should be explained here that there are only two stations, one at each end of the line, and the method of operation is much like that on ordinary cable inclines, there being two lines of track, and one car reaching the down station at the same time that the other arrives at the up station. There are, accordingly, no grips, in the ordinarily accepted sense of the word, in connection with cable cars, and starting and stopping of the cars is effected by starting and stopping the engines in the upper station. Still the cars may be stopped at any point along the line, in case of danger from obstructions, by applying the brakes, which, in turn, causes the engines to stop, an arrangement which will, no doubt, strike some of our readers as peculiar. The driving engines are of the double cylinder type, horizontal, and develop 15 horse-power, steam being furnished by a tubular boiler. The fly-wheel on one end of the crank shaft is used also as a brake-wheel. The opposite end of the shaft carries a bevel gear, from which, through a train of bevel gears, power is transmitted to the cable drum. The speed of the cable is about 6.1 ft. per second. The plant, moreover, is so arranged that water ballast may be used for driving the cars, tanks being provided on their roofs for this purpose. The water is led into these tanks from the city mains, and is allowed to escape from the tank of the down car after the latter has reached the foot of the incline. In many respects the whole system strikes one as being primitive, yet its working is said to have given every satisfaction.

Wave-Motors.

The idea of utilizing the force of the waves and tides to actuate motors has been a favorite one with many inventors, and a practical application is now in operation at Ocean Grove, N. J. This is the wave-motor invented by Mr. N. O. Bond, consisting of a series of swinging gates, submerged to some extent at all tides, a rod at the top of each gate actuating the piston of a pump for elevating water. Each incoming wave strikes the gates and swings them inward, thus operating the pumps. The gates are secured at the top to steel rods, whose ends oscillate in bearings formed by two piles. These bearings were well greased, but after the gates had operated for some time the bearings were examined, and it was found that none of the lubricant had been used up; consequently, the inventor thinks that it will only be necessary to erect the apparatus in a substantial manner, after which it can be operated without expense. Each gate is 12 ft. long, and it was found that the force acting to move the gates inward was about 500 lbs. per sq. ft. in a calm, and 800 lbs. in heavy surf.

Reasons for Hostility to Railroads.

It is probable that clear-headed railroad managers will not consent to expose their companies to more severe legislation by engaging in a trust. The arguments in favor of a repeal of the clause prohibiting railroad pools, however strongly they appeal to the interests of stock and bond holders, do not seem likely to affect the public mind at the West, or to remove the feeling to which that prohibition was due. The Western farmer or legislator thinks the railroads can be trusted not to ruin themselves by excessive competition, or by doing business at less than cost, and when he observes the prices of stocks and bonds in Wall street, and the glowing statements of railroad managers respecting the prosperity and the prospects of their companies, it is not strange that the Western opinion is exceedingly persistent.

Why have the great corporations invested enormous sums, partly borrowed at high rates of interest, in building new competing lines and pushing branches and extensions across sparsely settled States and Territories, if there is no profit in the transporting business? The Western people know that a large part of the additional mileage recently built has been constructed directly by the powerful corporations or with their aid, and for the purpose of securing for them a larger share in the transportation of the future. If this policy has not been utterly senseless and criminally wasteful, the corporations at least expect rich returns in the future—the returns so rich that they are willing to take heavy risks and forego much or all of their profits for the present. Watching this policy, the Western man not unreasonably infers that the railroad managers know what they are about, and are in fact tightening their grasp upon enormous wealth in the future, even while they are talking gloomily of possible bankruptcy. The railroad managers themselves have thus done a great deal to promote hostility to their corporations and to impair Western confidence in their statements, and their latest talk about trusts, combinations and legalized pools is peculiarly calculated to make their situation still less satisfactory.—New York Tribune.

There not being business enough to go around, the railroads ask for the legalization of a policy of taxing the public on what business there is to an extent that shall assure to all a fair profit (pooling). Having run a speculative riot for years they now beg to be saved from the just fruits of their folly. But it is pretty certain that present opinion is strongly opposed to any such course. Why should immunity from loss be extended to an unprofitable railroad investment any more than to other business ventures?—Springfield Republican.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulations of Railroads.

The Supreme Court of Minnesota rules that the statutes of that State making railroads liable for injuries by one employed to another applies only to those employees engaged in operating the railroad.

The Supreme Court of the United States holds that the

statutes of Oregon do not authorize a railroad to lease its road and franchises to another road or to take a lease of a railroad, and even after the road has been operated for a time under such a lease it may be repudiated.²

In Pennsylvania, a railroad, to secure its bonds, made a mortgage, which recited that it was expedient to fund certain coupons of prior bonds by the issue of scrip convertible into bonds, and that the bonds for which such mortgage was given had been issued for that purpose. Because of the doubtful validity of the mortgage, the bonds were destroyed before issuing, and another issue of bonds was made, secured by another mortgage, after which the first-mentioned mortgage was released by the trustees therein named. The Supreme Court holds that the holders of such coupons acquired no vested interest in the released mortgage, and that there was no contract for the issue of such scrip.³

The Supreme Court of Montana decides that the statute providing that every railroad corporation within the territory which shall damage or kill any horse by running against it with an engine shall be liable to the owner for its value, is unconstitutional and void, as creating a conclusive presumption of negligence from the injury.⁴

In Pennsylvania two railroads agreed, in regard to a crossing of the tracks at grade, that in the use or working of the railroads at or near the point of crossing, all trains, engines, or cars of the party of the second part shall come to a full stop at a distance of at least 300 ft. from the point of crossing, and shall not proceed until the proper signal shall have been given by the watchman in charge. All engines and trains of the party of the first part shall have priority of passage over the trains and engines of the party of the second part. The Supreme Court rules that this contract cannot be construed to mean that the priority given to the trains of the party of the first part over those of the other applied only when the respective trains are of the same class. There was no ambiguity, and the words "all trains and engines" were conclusive of the meaning of the parties. In this case also the party of the second part claimed the right to stop its trains for signals 800 or 900 yards distant from the crossing; but the master found that the topography of the vicinity, and the peculiar location of the tracks, made it necessary, in order to insure safety to the public, that the stops should be made not more than 300 yards from the crossing. The Supreme Court affirms this finding.⁵

In Kansas a proposition was submitted to the electors of a county to subscribe for stock in a railroad, and issue the bonds of the county therefor, on the condition that the railroad should be completed and in operation in the county, by lease or otherwise, from a connection with existing roads in the state, having direct and continuous lines of connection to the Missouri River, and also conditioned that the acceptance of the bonds issued in payment of the stock should be held and taken as a covenant binding upon the railroad company, its lessees or assigns, to maintain and operate said line of road, by lease or otherwise, over its route for a term of 99 years. The Supreme Court decides that an agreement by the railroad company, executed after the subscription of the county, to sell and transfer its road after it was completed, in order to obtain money for its construction, did not discharge or release the county from the payment of its subscription.⁶

The Supreme Court of Indiana rules that under the state statute, making it an indictable offense to wrongfully obstruct any highway, or for a person in charge of a freight train to permit it to stand across a highway, without having a space of 60 ft. across such street; a railroad company has no right to use and obstruct all the highway except the plank crossing over it.⁷

Carriage of Goods and Injury to Property.

The Supreme Court of Indiana holds that the fact that a bill of lading limited the damages recoverable to a certain sum, did not preclude a security for a larger sum which the general freight agent agreed to pay after the loss occurred.⁸

In this case a race horse was injured in a wreck, and the court rules that an agreement made by the railroad's general freight agent, who went to the place of the wreck by authority of defendant to look after the injured property and adjust claims for damages, by which defendant was to take the injured horse, and pay a certain plaintiff a sum in settlement of his damages, was within the authority of the agent and founded on a sufficient consideration.⁹

The United States Circuit Court holds that the offense of "unjust discrimination," under section 2 of the Interstate Commerce Act (24 U. S. St. at Large, p. 379), is not confined to discrimination by means of some device, as by a special rate, rebate, or drawback, but is committed by directly giving different rates to different persons.¹⁰

In Colorado, goods delivered to a railroad by plaintiff, for shipment, were, before their delivery to the consignee, directed to be delivered to S., the agent of the plaintiff. Afterward, on an order from S., directing that the goods be delivered to the consignee, and an order from the latter, directing that they be delivered to certain named persons, the goods were surrendered to such persons. On learning of such delivery, plaintiff made no objection, but began suit against the consignee for the value of the goods. The Supreme Court holds that the railroad is not liable for such delivery.¹¹

In a case in Iowa, on the question whether defendant agreed to give a right of way to a railroad company, one of the company testified that defendant told him before the construction of the road that he would not then sign a contract to give the right of way, but would give it. Three others testified that defendant said he would give the right of way if the road was built. It was shown that the securing of the right of way was a condition of the location of the road. Defendant, unsupported by other evidence, denied having made the promise. The Supreme Court affirms a judgment in favor of the railroad.¹²

The Supreme Court of Vermont holds that an instruction that the Legislature never intended to require a railroad to keep cattle-guards clear of snow and ice, when to do so would practically impose a burden upon the road incommensurate with its duty both to the public and its own passengers, was not erroneous, the court having charged that the roads must keep its cattle-guards sufficient in winter as well as in summer, and that under all circumstances it must discharge its obligation in a prudent manner. The statute does not require that a cattle-guard must be so built that under no circumstances can an animal cross it, but simply that under ordinary circumstances it shall be sufficient to prevent animals from getting on the track.¹³

In Pennsylvania the Supreme Court rules that though the construction stakes for a railroad are placed in a highway in the life-time of the abutting owner, the right of action for injuries consequential upon the construction of the road after his death is in the widow and heirs, and not in the personal representatives, there being no injury to such owner from the mere placing of the construction stakes.¹⁴

Injuries to Passengers, Employees and Strangers.

The California Code requires railroad companies to have conspicuously posted in their cars their rules regarding fare and conduct of passengers. Plaintiff was ejected from defendant's train for refusing to pay an extra

charge for riding in a certain car. Plaintiff alleged that he was wrongfully made to leave the car. He testified that the conductor pointed out to him, posted in the car, the regulations of the company; also that the conductor explained that he was required to collect an extra fare for riding in that car. There was no evidence or pretense that the explanations were not true. The Supreme Court holds that the court properly assumed that there was a regulation requiring an extra fare for riding in that car, and that plaintiff knew and willfully disobeyed it; the fact that his ticket was not returned to him before he was ejected is immaterial, and as he admitted that he received all his injuries after he had gone out of the car, and as a result of his holding on to the railing in resisting the force of those removing him, and the evidence does not show that more force than was necessary to put him off was employed, he cannot recover for injuries on the ground of the force employed.¹⁵

In New York a brakeman was knocked from the top of a car by a low bridge on a very dark night, and killed. No warning signals were displayed at the bridge, as provided by Laws N. Y., 1884, c. 439, § 2, requiring that warning signals shall be maintained at every low bridge which crosses a railroad track, if such signals are necessary for the protection of employes on top of cars; but there were such signals at bridges on each side and in close proximity to the one where the accident occurred, and it was shown that it was understood by the employes of the road that such signals would serve for the intervening bridges. It appeared that he had traveled past such bridges for several months before the accident. The Supreme Court holds the railroad not liable.¹⁶

In Pennsylvania a trackman in the employ of defendant had been so employed for nearly a year. At the time of his death he was working on the track with his back to the train that struck him. The train was a gravel train, and was running with the engine at the rear. The train had for over a year previous to the accident been making daily trips over the section on which deceased worked, and was run as on the day of the accident. The Supreme Court rules that the court properly refused the offer of evidence as to whether it was a safe or dangerous method of running a train with the cars pushed in front of the engine. The danger of being run down by one of these trains was one of the risks of the employment deceased had assumed.¹⁷

In Indiana the Supreme Court rules that where a railroad has been accustomed to maintain a flagman and gate at a crossing, the absence of the flagman, and the leaving open the gate is such an assurance of safety that a traveler crossing without looking for a train is not guilty of contributory negligence.¹⁸

The Supreme Court of Wisconsin states the law thus, as to the duty of an engineer at a crossing to sound the whistle: "If the injury could have been prevented by the blowing of the whistle, and the engineer had time to sound it after he saw plaintiff about to pass in front of the engine, and he failed to do so, in consequence of which plaintiff was injured while in the exercise of ordinary care, plaintiff could recover. But if, after the engineer saw that plaintiff was about to cross, he was putting forth other exertions to save plaintiff, and on account of them had not time to have the whistle sounded, his failure to do so would not constitute negligence."¹⁹

In Connecticut the defendant railroad ran a train at a high rate of speed, by a crossing within the limits of a city, where, until the train was within 20 ft. of the crossing, the view of the highway or of the train was intercepted by intervening objects for a distance of 200 ft., and plaintiff's intestate, who was driving on the highway, was run over and killed. The speed was not unusual; the locality of the crossing was not a thickly inhabited one, and the city, although authorized by its charter to do so, had made no order limiting the speed at such crossing. The Court of Errors holds that the required danger signals having been given, defendant was not negligent in not slackening speed, nor in not providing other signals at such crossing in addition to those required by the statute; the statute having specifically provided what signals should be required, and instructed the railroad commissioners to require other signals when they should deem them necessary. Nor was the railroad liable because the fireman on the train, who saw plaintiff's intestate, as the evidence tended to show, when he was about 80 ft. from the crossing, did not instantly call the attention of the engineer to such fact.²⁰

In New York the Supreme Court rules that it is not negligence to board a street car while it is moving slowly.²¹

In Indiana, while a train was approaching a town, the engine was detached, and run on ahead of the cars, leaving them to follow of their own momentum to the depot. The cars passed over a highway crossing near the depot, and, as deceased attempted to cross, he was killed. The jury returned a general verdict for plaintiff's representatives, but found specially that he had been familiar with the crossing for 10 years; that he was on foot, and on his way to the depot, when struck; that had he looked he could have seen about 200 ft. along the main track before reaching it; that it had been the habit of those in charge of the train some months before the injury to detach the engine and run it to the water-tank; that the train conductor stood on the depot platform, and shouted a warning to deceased, as did also a brakeman on the train; that the brakes were set from the time the engine was detached until deceased was struck; that the train was approaching at the rate of four miles an hour; and that there was nothing to prevent deceased from seeing it. On these facts the Supreme Court holds that the railroad is not liable.²²

In Pennsylvania it appeared that the railroad had for some time kept a watchman at a crossing and safety gates, which were lowered upon the approach of trains. On the night of the injury, when plaintiff, a fireman, approached the crossing with the hose carriage, the gates were not lowered. They had become out of order that morning, and had not been repaired. The watchman displayed no light and gave no warning. The hose carriage did not stop or slacken its speed as it approached the track, and was struck by a passing train, and plaintiff thrown off and injured. The Supreme Court rules that, notwithstanding the negligence of the company, the failure of the plaintiff to "stop, look and listen," would bar his right to recover.²³

¹ Paul Lavelle & R. v. St. Co., 41 N. W. Rep., 974.

² Oregon R. Co. v. Oregon Nav. Co., 9 Sut. Ct. Rep., 409.

³ Com. v. Wilmington & N. R. Co., 17 Atl. Rep., 5.

⁴ Thompson v. North. Pac. R. Co., 21 Pac. Rep., 25.

⁵ Appeal of Cornwall, 17 Atl. Rep., 427.

⁶ South Kan. & P. R. Co. v. Towner, 21 Pac. Rep., 221.

⁷ Pitts. & St. L. R. Co. v. Kitley, 20 N. E. Rep., 727.

⁸ Chicago & P. Co. v. R. C. Katzenbach, 20 N. E. Rep., 709.

⁹ Id.

¹⁰ U. S. v. Tozer, 37 Fed. Rep., 635.

¹¹ Brasher v. Denver & R. G. Co., 21 Pac. Rep., 44.

¹² Cherokee & D. R. Co. v. Renken, 42 N. W. Rep., 307.

¹³ Wait v. B. & R. Co., 17 Atl. Rep., 284.

¹⁴ Penn. v. R. Co. v. Ziener, 17 Atl. Rep., 187.

¹⁵ Wright v. Cal. Cent. R. Co., 20 Pac. Rep., 740.

¹⁶ Ryan v. L. I. R. Co., 4 N. Y. (Supp.), 381.

¹⁷ Kennedy v. Penn. R. Co., 17 Atl. Rep., 7.

¹⁸ Penn. Co. v. Stegmeier, 20 N. E. Rep., 843.

¹⁹ Heddles v. Chicago & N. R. Co., 42 N. W. Rep., 227.

²⁰ Dyson v. N. Y. & N. E. R. Co., 17 Atl. Rep., 137.

²¹ Valentine v. Broadway & S. A. R. Co., 4 N. Y. (Supp.), 481.

²² Chicago & E. I. R. Co. v. Hedges, 20 N. E. Rep., 530.

²³ Greenmoore v. P. W. & B. R. Co., 17 Atl. Rep., 188.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Central Pacific, \$1 per share, payable Aug. 1.
Cornwall & Lebanon, 2 per cent.
Mahoning Coal, 1½ per cent., payable Aug. 1.
New York, Providence & Boston, quarterly 2½ per cent., payable Aug. 10.
St. Louis & San Francisco, 3½ per cent. on the first preferred stock, payable Aug. 10.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Central New England & Western, special meeting, 115 Broadway, New York City, Aug. 30.
Housatonic, special meeting, Bridgeport, Conn., Aug. 13.
St. Catharines & Niagara Central, special meeting Aug. 13, St. Catharines, Ont.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Roadmasters' Association* will hold its next meeting in Boston, Aug. 21.

The *Roadmasters' Association of America* will hold its seventh annual convention at Denver, Colo., Sept. 10.

The *Master Car and Locomotive Painters' Association* will hold its next annual convention in Chicago Sept. 11.

The *American Association of General Passenger and Ticket Agents* will hold its next semi-annual meeting in Atlanta, Ga., Sept. 17.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month, except June, July and August. The next meeting will be held Sept. 11.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds its regular meeting on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in St. Louis on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Gerard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at the Club rooms, No. 24 West Fourth street, Cincinnati, at 8 p. m., on the fourth Thursday of each month.

The *Engineers' Club of Kansas City* meets at Kansas City, Mo., on the first Monday in each month.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Club of Kansas* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

American Society of Civil Engineers.

The annual convention of the Society, held at Seabright, N. J., adopted at its business meeting, June 24, 1889, the following resolutions:

That a committee of seven members of this Society be appointed by the President, to consider and report upon a systematic revision of the constitution and by-laws, so as to afford the Society the best basis for its continued growth and an increased measure of usefulness.

That all members having suggestions to make upon the subjects referred to the committee, be requested to offer to the constitution and by-laws, be requested to send the same to the Chairman of the committee.

That the committee, if it decide to recommend any amendments to the constitution and by-laws, be instructed to present the same, together with the views of the committee upon the same, in the manner and within the time provided for offering such amendments.

That the Board of Direction be requested to have the report of the committee printed and distributed to the members, with the proposed amendments.

That the committee be authorized to confer with any committees appointed for the purpose, by the local engineering societies, with a view of determining whether a satisfactory basis can be established for affiliating therewith.

That the committee make a final report at the next annual meeting.

In accordance with the second resolution members are requested to forward to the address of the Chairman of the committee appointed under said resolutions any suggestions upon the subjects referred to the committee, or any amendments which they may have to offer to the constitution or by-laws. It is very desirable that these suggestions should be made promptly, as the time is very limited within which the committee has to do its work. The Chairman is Mr. William P. Shinn, 36 Wall street, New York.

Electric Light Convention.

The New York, Lake Erie & Western is to run a special train to Niagara Falls, Aug. 5, to convey those who go to attend the Electric Light Convention at that place. The train starts at 9 a. m., and it is said that the Erie is taking great pains to make this train one of the finest ever run out of New York. Tickets may be had at the office of the Electric Light Association, 18 Cortlandt street.

PERSONAL.

—Mr. H. H. Filley, Consulting Engineer of the Mexican National Construction Co., has been elected Second Vice-President of the Engineers' Club of Kansas City.

—Mr. W. H. Pratt, C. E., is now Superintendent of Mount Vernon Bridge Co.'s works at Mount Vernon, O. He was formerly connected with the Edge Moor Bridge Works.

—Mr. W. F. Norton, a brother of President Eckstein Norton, of the Louisville & Nashville, and one of the largest stockholders in that road, died at Louisville last week. He was reputed the wealthiest resident of Kentucky.

—Col. N. Bothas, Passenger Agent of the Queen & Crescent route in Birmingham, Ala., has sailed for his old home in Prussia, where he will serve a term in the army for the purpose of securing his title to an inheritance from his father.

—Francis Jacquemin, General Manager of the Eastern Railroad of France, one of the most eminent railroad men of his country, died recently at the age of 69. His name will be familiar to the older readers of the *Railroad Gazette* from his account of the organization, treatment, invalid and pension funds, etc., of French railroad employés, which was published in these columns in 1877, and afterward in a pamphlet, which was the first publication in this country to attract attention to such organizations. This was a chapter of a treatise in two volumes on "Railroad Operation," consisting of lectures delivered by Mr. Jacquemin before the famous French School of Bridges and Highways, of which he was a graduate. After some years of service in railroad construction, he became engaged in the operating department of the Eastern Railroad, and in 1872 was placed at the head of it. He wrote much on railroads besides the treatise already mentioned, including a work on the services of the French railroads during the Franco-Prussian war, in which, naturally, his own system played a great part. At the time of his death he held the post of Honorary General Inspector of the Corps of Bridges and Highways, and was a Commander of the Legion of Honor.

ELECTIONS AND APPOINTMENTS.

Au Sable & Northwestern.—The officers of this road are: President, D. Tisdale; Secretary, W. S. Waugh; General Manager, J. E. Potts, and General Superintendent, Milo Davis. The office is at Au Sable, Mich.

Bowling Green & Northern.—At the annual meeting of board of directors of the road, held at Bowling Green, Ky., last week, the following officers were elected: Ex-Gov. J. Proctor Knott, President; J. D. Hines, Vice-President; C. U. McElroy, Treasurer, and M. H. Crump, Secretary.

Cairo, Vincennes & Chicago.—J. W. Simmons has been appointed Superintendent, with office at Mt. Carmel, Ill., to succeed C. E. Doyle, resigned to enter the service of another road.

Chesapeake & Ohio.—M. M. Cassidy has been appointed General Advertising Agent, with headquarters at Cincinnati, O.

Chicago, Dayton & Cincinnati.—The following directors have been elected: L. P. Milligan, C. E. Bryant, S. F. Day, G. G. Pride, of this city, and Hugh Dougherty, L. P. Williamson and L. C. Davenport, of Bluffton.

Duluth, Milbank, Huron & Chamberlain.—The following officers have been chosen: D. W. Diggs, of Milbank, Dak., President; Col. W. H. Lamb, of Clark, Vice-President; Irving Balch, of Milbank, Secretary; J. T. Sterns, of Chamberlain, Treasurer.

Evansville, Suburban & Newburg.—T. J. Carrigan has been appointed Superintendent in place of P. T. Bradford, Superintendent, and P. Stevenson, Roadmaster, who have resigned, the two offices being consolidated.

Goodyear, Neillville & Northern.—The officers of the company are: D. A. Goodyear, President; C. A. Goodyear, Vice-President and General Manager, both of Tomah, Wis.; and Y. V. Beebe, of New Lisbon, Wis., Chief Engineer.

Houston, Central Arkansas & Northern.—James B. Greene, Trainmaster of the St. Louis, Iron Mountain & Southern, has been appointed Superintendent of this road, with headquarters at Monroe, La.

Illinois Central.—J. F. Merry, General Western Passenger Agent, has been appointed Assistant General Passenger Agent of the lines in Iowa. His headquarters will be at Manchester, Ia.

Mexican Central.—J. H. Kain has been appointed Chief Engineer of all this company's lines, with headquarters in the city of San Luis Potosi.

Milbank, Egan & Sioux City.—The following have been elected officers for this Dakota company: William M. Brooke, of Brookings, Dak., President; J. H. Eno, of Egan, First Vice-President; Henry T. Volkman, of Milbank, Second Vice-President; W. B. Saunders, of Milbank, Treasurer; D. W. Diggs, of Milbank, Secretary.

Monterey & Northwestern.—Geronimo Trevino, Emeterio de la Garza and Joseph A. Robertson, Monterey, Mexico; J. J. Fisher, St. Louis, Mo.; Thomas S. Bullock and Francis C. B. Avery, New York, and Victor A. Wilder, Brooklyn, N. Y., are the Directors; T. S. Bullock, Hotel Brunswick, New York City, and Victor A. Wilder, 96 Sixth Ave., Brooklyn, subscribe for 496 shares of the capital stock.

Natchez, Jackson & Columbus.—E. W. How, General Freight and Passenger Agent; P. R. Rogers, Assistant General Passenger Agent; R. B. Maury, General Traveling Passenger Agent, at Memphis, Tenn.; R. F. Reynolds, Commercial Agent, at New Orleans, La., of the Louisville, New Orleans & Texas, have had their authority extended over this line.

New York, Fort Wayne & Chicago.—The following officers were elected at a meeting held at Plymouth, Ind., last week: President, John Lee, of Crawfordville, Ind.; Vice-President, J. A. Funk, of Warsaw, Ind.; Secretary, O. M. Packard; Treasurer, M. W. Simons, both of Plymouth.

Richmond, Nicholasville, Irvine & Beattyville.—This company elected the following board of directors at a recent meeting: J. W. Stine, V. D. Price, Adolph Schmidt, T. W. Bullett, W. W. Hill, Dennis Long, of Louisville; E. R. Sparks, B. M. Arnett, W. L. Steele, of Jessamine; William Irvine, C. D. Chennault, Newland Jones, Charles Searcy, of Madison; W. T. B. Williams, of Estill; D. B. Maloney, Secretary. The Board of Directors elected Maj. J. W. Stine, President; W. W. Hill, Secretary, and William Cornwall, Treasurer.

Shelby & Western.—This Alabama company has been incorporated by Newton Case, Daniel Phillips, Lucius A. Barbour and Ward W. Jacobs, all of Hartford, Conn.; J. Andrew Pickett, of New Britain, Conn.; James W. Lapsley, of Augusta County, Ala.; William S. North, Chicago, Ill.; Homer R. Stoughton, Shelby County, Ala., and Anthony W. Stanley, of Gransby, Conn.

Stuttgart & Arkansas River.—The following are the officers of this Arkansas company: H. J. Campbell, President; T. H. Leslie, Vice-President and Secretary; A. D. Swan, Land Commissioner; W. F. Durrell, Treasurer; and C. K. Leslie, Assistant Treasurer. The office is at Stuttgart, Ark.

Tobacco Belt.—The following are the officers of this Florida road: L. B. Plumer, President; R. H. Marks, Vice-President and Land Commissioner; W. S. Jordan, Treasurer and General Manager; H. J. McCall, Auditor and General

Counsel. The headquarters of the company are at Madison, Fla.

Toledo, Findlay & Springfield.—The company was organized at Findlay, O., July 25, with the following directors: W. T. Walker, Henry A. Brown, H. C. Hahn, Alfred Wilkin and George Sherman. The officers are: President, W. T. Walker; Treasurer and Secretary, H. A. Brown. T. F. Brown is contractor.

West Virginia & Pennsylvania.—The following are the officers of this West Virginia company: President, Thomas G. Hillhouse; Vice-President, George M. Hoover; Secretary and Treasurer, John C. Ten Eyck, all of New York city.

OLD AND NEW ROADS.

Albert Southern.—The New Brunswick government are insisting on the immediate completion of this road, and have issued a writ demanding that it be completed within six months, failing in which the government will take over the road and finish it as a government work. In 1884 parliament voted a subsidy of \$3,200 per mile to the company for 16 miles, the road to run from Hopewell to Albert, New Brunswick. Owing to non-fulfillment of contract this subsidy lapsed, but was revoked on the understanding that the road would be completed July 1, 1888. A further extension was granted, and the government is now determined that the work shall be finished within six months.

Arcadia, Alexandria & Fort Smith.—The survey for this road was commenced at Arcadia, La., July 22, under the direction of A. T. Smith.

Arkansas Midland.—The company is recording in Arkansas a mortgage for \$300,000, given to secure an equal amount of first mortgage bonds. The bonds are issued on the 49 miles of main line from Helena to Clarendon, and also on such branches or extensions as may be built. They were issued for the purpose of equipping and extending the road, and constructing branches to Indian Bay, in Monroe County, and Old Town, in Phillips County.

The company is to relay the track of its main line, from Helena to Clarendon, 48 miles, with steel rails, the old rails being used on two branches which it is proposed to build from the main line south to Indian Bay and Old Town Ridge. It is proposed to commence work next year on a westerly extension from Clarendon toward Little Rock.

Au Sable & Northwestern.—This line, which was formerly operated solely as a lumber road by the J. E. Potts Lumber Co., was opened July 15 to general freight and passenger business, though logs and lumber still remain the principal freight traffic. It is a narrow gauge and extends from Potts, in Oscoda County, Mich., east to Au Sable, a distance of 40 miles. It is proposed to extend the line from Potts north through Montmorency and Presque Isle counties, but as yet no surveys have been made.

Brantford, Waterloo & Lake Erie.—A general meeting of the shareholders of this company will be held at Brantford, Aug. 20, for the purpose of sanctioning the issue of bonds to the amount of \$20,000 per mile, and the disposal thereof, and of the unissued stock in payment of right of way and work of construction.

Briarfield, Blockton & Birmingham.—Grading is being pushed rapidly between Montevallo and Bessemer, Ala., and tracklaying will commence on this section about Aug. 15. The contract for building the line from Bessemer into Birmingham will be let shortly.

Brinkley & Helena.—Tracklaying is in progress from Brinkley south to Pine City, Ark., on the Arkansas Midland road, over which line trains will be run to Helena. J. M. Fowles, of Brinkley, is interested.

Burlington & Missouri River.—About ten miles of track has been laid from Alliance, Neb., northwest on the extension from that city. Large quantities of construction material are being forwarded to Alliance, and the contractors are rapidly pushing the work.

Campbell Hall Connecting.—The stockholders have voted to authorize a mortgage on the road to secure an issue of bonds for \$500,000. The road is to be built as an extension of the Pennsylvania, Poughkeepsie & Boston from Liberty Corners, Orange County, N. Y., northeast 18 miles, to Campbell Hall, connecting at that point with the Central New England & Western.

Canadian Pacific.—A statement of the land sales of the company for June shows that 28,000 acres were disposed of for \$99,000, while in June, 1888, 11,759 acres were sold for \$38,324. For the six months ending 30th June last, 134,967 acres were sold for \$487,219, against 42,737 acres, valued at \$150,681, during the corresponding period of 1888.

Canada Southern.—This company gives notice that in pursuance of an Act of Parliament the amalgamation of the Erie & Niagara railroad with this company has been completed, to date from July 8, 1889.

Chicago, Burlington & Quincy.—The gross earnings for June were \$2,109,207, an increase over the corresponding month last year of \$155,427. The net earnings were \$842,361, an increase of \$487,761. From Jan. 1 to June 30 the gross earnings were \$11,962,777, an increase over the corresponding period of last year of \$1,986,811; the net earnings were \$3,822,254, an increase of \$2,528,823. In June the properties controlled by the Chicago, Burlington & Quincy, but not included in the above, gained \$82,947 gross and \$46,559 net. From Jan. 1 to June 30 the gross increase was \$824,481, and the net increase \$611,833.

Chicago, Kansas & Nebraska.—It is expected to have the extension from Pond Creek south 60 miles to Kingfisher, I. T., completed by Oct. 1. Over ten miles of grading has been finished, and tracklaying will soon commence. The names of the contractors have already been given in these columns.

Chicago & West Michigan.—Fitzgerald & Co., of Lincoln, Neb., have been awarded the contract for grubbing, grading and tracklaying the extension north from Baldwin to Traverse City, Mich., 75 miles. The contract price is \$230,000. The extension will be built through extensive hardwood forests nearly the entire distance, and through a very sparsely settled country. It is to be completed by July 1, 1890. The contract does not include the iron bridge over the Manistee River, which will be 1,200 ft. long and 80 ft. high.

Fitzgerald & Co., of Lincoln, Neb., have been given the contract for building the extension north from Baldwin to Traverse City, Mich., 75 miles. It is expected that the line will be completed by July 1, 1890. Nearly the whole of the route is through a heavy hardwood forest.

Cordova & Tuxtepec.—This road which is being rapidly constructed in Mexico, has been opened for business from Cordova through Amatlan to Chichapa, in the state of Vera Cruz.

Decatur, Chesapeake & New Orleans.—The American Trust Co. has been given a mortgage on this road for \$3,000,000 to secure an issue of 6 per cent. bonds due in 40 years.

Denver, Leadville & Gunnison.—The Denver, South Park & Pacific Division of the Union Pacific system, which was sold at foreclosure sale at Denver last week, will be hereafter known under this name. The road is 325 miles long, the main line extending from Denver to Baldwin mines, 219 miles, there being many short branches. The road will continue to be managed by the Union Pacific, the foreclosure sale having given that company fuller possession than it previously had. The capital stock of the new company is \$3,000,000, at which price the road was purchased at the sale.

Forest City & Sioux City.—Work is to be resumed at once on this road, and it is claimed that it will be completed by Oct. 1 from Gettysburg, the terminus of a branch of the Chicago & Northwestern, to Forest City, Dak., a distance of 16 miles. It is proposed to build a bridge over the Missouri River at Forest City.

Freehold & New York.—The extension of this road to Hopping Junction, N. J., which is being built by the Central of New Jersey, is now nearly completed. The line gives the Central of New Jersey a nearly direct line from New York to Atlantic Highlands and other summer resorts on the Atlantic Coast in New Jersey.

Georgia.—Bills have been introduced in the legislature to incorporate the Chattanooga & National Park railroad to build to and around the Chickamauga battlefields, and also to incorporate the following roads: Catoosa; Long Shoals & Rockdale; and Artesian City roads, and to amend the charter of the Georgia Southern & Florida by authorizing that company to indorse the bonds of the Macon & Birmingham.

Grand Trunk.—Engineers have commenced the survey for the proposed extension of the Haliburton Division from Haliburton to Mattawa, Ont., by which it is proposed to greatly shorten the distance between Mattawa and Toronto. It is expected that the new line will be completed by the end of 1890.

The double track of this line from Cornwall, Ont., to Montreal, Que., 67 miles, will be completed in three weeks. It is expected the double track will be finished from Brockville, Ont., to Iroquois, Ont., 22 miles, and from Wales to Cornwall, this season. This will leave 22 miles between Iroquois and Wales, which may not be finished until next year.

Greenfield & Northern.—T. A. Miller is building this road from Greenfield, Mo., north to Stockton, 20 miles, and has about five miles graded. L. W. Shafer, of Greenfield, is President.

Henderson State Line.—On Sept. 2 the people of Henderson, Ky., will vote on the proposition to grant \$75,000 to this company to aid it in building the proposed road. A similar proposition was once before submitted, but it was withdrawn before the election was held.

Intercolonial.—Arrangements have been completed between this company and the Grand Trunk, by which the time of passenger trains between Halifax and Montreal has been shortened nine hours. This is the result of competition with the new Canadian Pacific line through the State of Maine to the Maritime provinces.

Kentucky & Tennessee.—The town of Hopkinsville, Ky., has been asked to vote \$100,000 to this company, to be used in building the proposed road from Hopkinsville to a connection with the Newport News & Mississippi Valley Co.'s road, about 25 miles from Hopkinsville.

Knoxville & Northeastern.—On Sept. 14 next Knox County, Tenn., is to vote on the proposition to subscribe \$100,000 in county bonds to aid this company in building its proposed road. The proposition provides that if the bonds are voted construction is to commence within four months of the date of the election, and is to be continually and vigorously pushed, until ready for operation within 2½ years after work has been started. F. I. Stone is President.

Lansing & Northwestern.—This company expects to let the contracts for building the road by Sept. 1. The survey is now being made from Lansing, Mich., north to Maple Rapids, 25 miles, and it is claimed that the road will be completed to that point by Jan. 1 next. From Maple Rapids it is proposed to continue the line north to either Mackinaw City or Rogers City. A. O. Bement, of Lansing, is President.

Lexington Belt.—This company, which is building a belt road at Lexington, Ky., to connect the roads entering that city, has given a mortgage to the Security Trust and Safety Vault Co. for \$150,000.

Louisiana, Arkansas & Missouri.—The Frim-Bam Brick Construction Co., of St. Louis, is reported to have been given the contract for building the road from Delhi, La., to Trippe Junction, Ark., 81 miles. The road, as projected, is to extend from Brinkley to Alexandria, La., and it is claimed that the contracts for constructing north from Trippe Junction and south from Delhi will be let early next spring. G. N. Polk, of Delhi, is engineer.

Louisiana, North & South.—Work was commenced July 29 on an extension from Gibsland, La., the southern terminus, south about four miles, for which section the contract has been let. The extension is to be continued south to Sparta, the county seat of Bienville Parish, about 16 miles. When this line is completed work will be commenced on the extension north from Homer, to a connection with the St. Louis, Arkansas & Texas.

Louisville, Cincinnati & Virginia.—This company proposes to build a road from Winchester, Clark County, Ky., southeast to Beattyville, Lee County, about 35 miles. It has submitted propositions to the counties through which it proposes to build, asking for subscriptions by the counties to aid in constructing the line. On July 18 Clark County voted in favor of the subscription by 450 majority, but on July 20 Estill County voted against the proposition by 442 majority. It is not yet definitely known what effect this will have upon the future prospects of the road.

Louisville, Madison & Cincinnati.—A corps of engineers are surveying in Utica Township, Ind., for the route of this proposed road.

Louisville, New Orleans & Texas.—The extension from Coahoma, Miss., on the main line south 50 miles to Rose-dale, where connection is made with the Rose-dale branch, built last summer, is to be completed by Aug. 31. The contractors are Fudge & Strang, south 25 miles, and Flynn & De Gairs, north 25 miles; the latter also do the tracklaying. The company has completed a 10½-mile connection from Hampton, Miss., on the Lake Washington branch, to Rolling Fork, on the main line. As already stated, there has also been completed 1.7 mile branch from Slaughter, La., on the main line, to connect at Bayou Sara with the old Woodville & Bayou Sara road. The company will widen to standard

gauge the narrow gauge from Lula to Glendale, Miss., opposite Helena, build transfers and construct terminals in Helena. The incline will be built by B. J. Linnehan. The work in Helena, about 4,000 yards, is let to J. C. Stansell, of Memphis.

Louisville Southern.—Engineers have been surveying a proposed line from Shelbyville east through Benson to Frankfort, Ky., to connect at the latter point with the Kentucky Midland, now being built.

Missouri, Tennessee & Georgia.—The engineers who are now in the field surveying from Humboldt, Tenn., to Hickman, Ky., will have their estimates for this section of the road finished in about two weeks. The company expects to let contracts for building at least part of the line before Sept. 1. W. A. Crawley, Humboldt, Tenn., is Vice-President.

Monterey & Northwestern.—This company has filed a charter in New York to build a road in the Republic of Mexico from the city of Monterey, in the state of Nuevo Leon, northwesterly through the states of Nueva Leon, Coahuila and Chihuahua by way of Venadito. The capital stock is \$10,000. The line will be a branch of the Monterey & Mexican Gulf.

New Orleans, Fort Jackson & Grand Isle.—Rail for about 60 miles of this road have been purchased and are now being shipped. As soon as they are received tracklaying will commence. About 15 miles of the line is now graded. The locating survey is still in progress, but the preliminary survey is all finished from New Orleans down the Mississippi River to Fort Jackson, and to Grand Isle on the Gulf of Mexico at the outlet of Barataria Bay, a distance of about 85 miles. Charles S. Dwight, of New Orleans, is Superintendent and Chief Engineer.

New Roads.—A preliminary survey is to be made at once from Talbotton, Ga., east about 10 miles to Waverly Hall on the Georgia Midland & Gulf road.

The survey was commenced last week under Louis Engstfeld, for the proposed road from Memphis to Raleigh, Tenn., about 10 miles.

New York Central & Hudson River.—The work of four-tracking on the Harlem Division in New York City, between Mott Haven and Woodlawn, which in connection with the change of grade to admit of carrying a large number of streets above the railroad, has been in progress for about a year, has now been completed so far as to admit of the use of about five miles of the new track. The track now in use is in two sections. At the northerly end, beginning at the junction of the New York, New Haven & Hartford, the new tracks have been completed and the four tracks in use for several weeks for about two miles, to a point between Williams Bridge and Fordham. On this portion the grade remains substantially unchanged, and gravel ballast is used on most of it. From Fordham south to the junction of the Hudson River division, about 3½ miles, the two new tracks were put in use this week, and will be used by all trains during the sinking of the two old tracks. This 3½-mile section embraces the heaviest work. The new tracks, which on this portion are ballasted with broken stone quarried nearby, have been laid to the west of the old ones, the original right of way making it possible to do this by moving the old tracks a few feet to the east. The retaining wall, which varies from 3 ft. to 40 ft. in height, the average being about 10 ft., is completed on the west side for the whole of this section, with the exception of two or three short stretches where the adjoining land is meadow or owned by the railroad company. The heavy work for this section may be regarded as now half done, as the excavation for sinking the old tracks and the work of building the retaining wall on the east side will be about the same as that already done, possibly a little heavier. Much of the stone for this wall is already on the ground.

The new yard for storage of passenger cars, at the junction of the Hudson River and Harlem divisions, five miles from the Grand Central Station, now contains about 15 miles of track, some 30 acres of rocky uplands and low swamps having been leveled off during the past six months. The company is building at this point, in the space within the main track Y, a roundhouse to hold 25 locomotives.

New York, Fort Wayne & Chicago.—This name has been adopted for a company which was organized at Plymouth, Ind., last week to build a road from Fort Wayne to South Chicago, 135 miles, paralleling the Pittsburgh, Fort Wayne & Chicago.

New York, Lake Erie & Western.—The following table shows the gross and net earnings and the operating expenses for June and the fiscal year to that date:

Month of June.	1889.	1888.	Inc.
Gross earnings.....	\$2,311,604	\$2,282,194	\$29,410
Oper. expenses.....	1,490,055	1,470,069	19,986
Less proportion due leased lines.....	\$821,549	\$812,125	\$9,424
Net earnings.....	\$205,895	\$201,141	\$4,753
Net earnings.....	\$615,654	\$610,984	\$4,671
Nine months, Oct. 1 to June 30.	1889.	1888.	Dec.
Gross earnings.....	\$19,160,998	\$20,019,664	\$858,666
Oper. expenses.....	12,531,419	13,061,853	530,434
Less proportion due leased lines.....	\$6,629,579	\$6,957,811	\$328,232
Net earnings.....	1,707,840	1,756,250	48,410
Net earnings.....	\$4,921,739	\$5,201,561	\$279,822

New York, Ontario & Western.—Ward & Leary, who have the contract to build the "zig zag" tunnel on the road near Franklin, N. Y., have 500 men at work. They are using two steam shovels, two locomotives and 100 cars. They expect to complete the work in a year and a half.

Norfolk & Carolina.—It is expected to have the line opened for traffic by Oct. 15. The grading has been completed, and tracklaying is in progress west of North Carolina, it having been completed in Virginia.

Old Colony.—About four miles of track have been laid on the North Attleboro & Wrentham division of the road, and it is expected to have the entire 12 miles completed and in operation by Dec. 1 next. J. J. S. Hassler is General Manager, with office in Forest City.

Palatka & Lake Shore.—Surveys are soon to commence on this road, which is projected to extend from Palatka to a point on the Florida Midland and thence to Kissimmee.

Philadelphia & Reading.—The statement of the operation of the railroad for the month of June, 1889, as compared with the same month of 1888 is as follows:

	1889.	1888.	Inc. or Dec.
Gross receipts.....	\$1,536,732	\$1,731,737	D. \$195,005
Gross exp. (excl. rent and interest).....	1,112,276	830,776	I. 281,500
Profit in operating.....	424,456	900,961	D. 476,505
Profit from Dec. 1 to date.	3,662,042	4,296,102	D. 634,060

Richmond, Nicholasville, Irvine & Beattyville.—Tracklaying is to begin this week on the section between Nicholasville and Richmond, Ky., 22 miles, upon which grading is nearly all finished. As already stated, the Ohio Valley Improvement & Contract Co., which is building the line, will immediately let the contract for the grading, masonry, tunneling and trestling on the 57 miles between Richmond and Beattyville. As soon as the contract is let, work will be pushed to speedy completion.

Shelby & Alabama Central.—Articles of incorporation have been filed in Alabama to build a road from Columbiana in Shelby County, to Sylacauga, in Talladega County, a distance of about 28 miles. The capital stock is placed at \$100,000.

Shelby & Western.—The company has been chartered in Alabama by the same incorporators as the Shelby & Alabama Central to build a line from Shelby to Calera, in Shelby County, 11 miles. The capital stock is \$100,000.

Sioux City & Northern.—The contract for bridging and grading the road from Merrill, in Plymouth County, 18 miles from Sioux City, Ia., to Palisades, Minnehaha County, S. D., 83 miles, was let last week by the Sioux City & Northern Contracting Company to E. P. Reynolds & Co., who are now building the first 100-mile section of the Pacific Short Line. There were nine bids submitted. The work is to be finished by Nov. 1. Trains will run into Sioux City from Merrill over the tracks of the Illinois Central. The St. Paul, Minneapolis & Manitoba will operate the road when it is completed.

South Brunswick Terminal.—McDermid & Ross, the contractors who are building this road from South Brunswick to Waynesville, Ga., 16 miles, and recently ordered the work stopped, have now resumed, having satisfactorily settled some disputed points with the officers of the roads.

Tennessee & Ohio.—It is stated that the control of this road has been secured by the East Tennessee, Virginia & Georgia, or by parties largely interested in that company. The road extends from Rogersville Junction, Tenn., on the East Tennessee, Virginia & Georgia north 16 miles to Rogersville. The survey has been made from Rogersville to Big Stone Gap, Va., 55 miles, and it is thought that funds will now be secured for building this extension.

Toledo, Findlay & Springfield.—It is claimed that work will commence this month on the section between Bowling Green and North Baltimore, a distance of 15 miles. This is to be put in operation, and the line extended south from North Baltimore to Findlay.

Yankton, Norfolk & Southeastern.—The contract for grading the road has been let to Jones Bros., of Yankton, Dak., who are to commence work immediately.

TRAFFIC.

Traffic Notes.

The Louisville & Nashville has discontinued the sale of tickets over the Louisville, New Albany & Chicago and has asked its connections to take the same action.

The roads of the Central Traffic Association will carry freight for the National Encampment of the Grand Army of the Republic in Milwaukee, Aug. 27, at half rates.

The Trunk Lines and Central Traffic Association roads have agreed upon a rule to be applied between April 1 and Nov. 30, by which dressed poultry and dressed fish in iced packages will be billed at 20 less than actual gross rates.

The Canadian Pacific has taken a contract to transport 10,000 tons of Pennsylvania coke from Algoma Mills, where it is brought by vessel from Lake Erie ports to Sudbury, where it will be used for smelting copper and other ores.

On July 30 the Central of Georgia carried to Birmingham, Ala., a complimentary excursion of about 700 people, consisting chiefly of stockholders of the Savannah & Western from Sumter and Marion counties, with their families and friends. A number of the company went on to Kansas City, and all were guests of the railroad company.

The Denver, Texas & Ft. Worth, which reduced west-bound freight rates a few days ago, has announced a reduction in east-bound rates from Denver to New York and the Atlantic seaboard, via Galveston, and by boat the rest of the way. The reduction on first-class is 18 cents, and on the other classes in proportion. The Trans-Missouri Association has decided to meet these rates only on freight going via the Chesapeake & Ohio or routes further south.

The Chicago, St. Louis & Pittsburgh announced at Chicago, last week, a material reduction in passenger rates between Chicago and Indianapolis, and Ohio River points. The following is a comparison of the new and old rates:

	Chicago to	New.	Old.
Indianapolis.....	\$3.50	\$3.50	
New Albany.....	5.00	8.75	
Louisville.....	2.00	9.00	
Cincinnati.....	5.00	8.80	

The new rates went into effect this week. The reasons for the reduction are variously given. The most plausible explanation is that mileage tickets have been handled extensively by scalpers, and that many roads accept them without enforcing the non-transferable condition. A Chicago dispatch of Monday states that a large share of all the passenger business out of Chicago in all directions is carried on mileage tickets, which the scalpers buy at 2 cents a mile and sell at any rate above cost. One broker's office is said to have been supplied with mileage tickets for every road out of Chicago excepting the Chicago & Alton. The other roads met the reduction Aug. 1.

Missouri Freight Rates.

The hearing before the Missouri Railroad Commissioners, in the matter of local freight rates was continued on July 25, after which the board issued the following order:

"Conferences with managers and representatives of the lines interested being concluded, the commissioners decide that the coal rate of 55 cents per ton as heretofore established for the Chicago & Alton and the Missouri Pacific Railways must also apply to other lines hauling coal to Kansas City from mines in Missouri, and it is therefore ordered that on and after Aug. 6, 1889, the maximum rate for the transportation of coal in car-loads from mines on the Wabash, Chicago, Santa Fe & California, Kansas City, Clinton & Springfield and Kansas City & Southern railways to Kansas City shall not exceed 55 cents per ton of 2,000 pounds for any distance up to and including 55 miles."

It appears that no action was taken on the grain and cattle rates, the officers of the principal roads having agreed to make certain reductions, which are regarded by the commissioners as satisfactory. Reduction in grain rates from local points to terminals, and amounting on an average to about 10 per cent., has been agreed upon by the Missouri Pacific, the Wabash and Chicago & Alton. In live stock rates a reduction of about 15 per cent. has been agreed upon by the lines from Kansas City eastward. The new live stock

tariffs of the Chicago, Rock Island & Pacific and Chicago & Alton are already filed. The commissioners did not order any reduction in rates on the second class lines of the state.

The Transcontinental Association.

Representatives of the roads in this Association have been in consultation at Chicago for over a week considering the differences between the Canadian Pacific and the American lines. As is well known, the Southern Pacific suffers from the competition of the Canadian Pacific more than any other line, and it is now seeking to induce the Canadian road to raise its rates. An alternative was considered by which the Canadian Pacific should charge the regular rate in force on the American lines, but be guaranteed a percentage of the business; but the Southern Pacific was willing to allow the Canadian line only 6 per cent. of the total traffic, which proposition was quickly refused. A report of this meeting has been published each day, but each report is a repetition of the first one, which stated that much time was spent in discussion, but that no agreement could be reached. Dispatches of July 31, however, stated that an agreement had been reached, the Canadian Pacific agreeing to a reduction of about 25 per cent. in its differential, this very slight change to be tried for three months.

The differences between the Union Pacific and the Northern Pacific concerning passenger traffic between the East and Puget Sound points, which the latter demands exclusive control of and which the former wishes to secure a share of, have also been considered, but with no prospect of settlement as yet. It is stated that the Denver & Rio Grande asks for the privilege of charging a lower rate on Pacific coast traffic on account of the disadvantage of its narrow gauge, and it is further stated that the Pacific Mail Steamship Co. receives a subsidy from the association, and that it asks to have it increased.

On July 25 Chairman Smith submitted a report of the business of the Association from its re-organization, Jan. 1, 1888, to April 30, 1889. The report shows that from Feb. 1, 1888, to Dec. 31 of the same year, the west-bound ton-mileage was 1,036,468,360, on which the total revenue was \$11,445,689, and the east-bound 488,581,120, on which the revenue was \$4,375,485. The rate per ton per mile west-bound was 1.104 cents and east-bound .896 cents. The average rate per 100 lbs. was 1.216 cents on west-bound business and .966 on east-bound. From Jan. 1, 1889, to April 30 the total revenue was \$4,153,115 west-bound and \$1,142,888 east-bound, and the average rate 1.296 cents per ton per mile west-bound and .879 cents east-bound. The destination of east-bound Pacific coast business from January to April 30 was as follows: To Atlantic seaboard and common points, 15.45 per cent.; Buffalo, Pittsburgh and common points, 1.59; Detroit, Toledo, Cincinnati and common points, 2.95; Chicago and common points, 16.10; St. Louis and common points, 25.41; Missouri River, 38. The origin of the west-bound Pacific coast for the same period was as follows: From Atlantic seaboard, 36.60 per cent.; Buffalo, Pittsburgh, etc., 19.13; Detroit, Toledo, Cincinnati, etc., 11.31; Chicago, 17.63; St. Louis, 10.18; Missouri River, 8. From Jan. 1 to April 30, 40,909 passengers were carried west-bound at an average rate of \$43.93, and 26,627 passengers were carried east-bound at an average rate of \$41.77. The total revenue from passenger traffic was \$2,141,726. The movement of tonnage for the first three months of 1889, in comparison with the corresponding period of 1888, shows a decrease of 24,327 tons and an increase of revenue of \$106,150.

Division of Live Stock Traffic.

Nine hundred and thirty-nine car-loads of cattle were carried from Kansas City to Chicago in the week ending July 20, and 1,736 car-loads received at Kansas City during that time. Of the number shipped into Kansas City, the Santa Fe brought 808 cars, the Missouri Pacific 327, the Rock Island 197, the Union Pacific 102, the Burlington 85, the Missouri, Kansas & Texas 101, Kansas City, Fort Scott & Memphis 65, other roads 45. Of the car-loads taken to Chicago the Santa Fe took 171, the Alton 168, the Burlington 168, the Wabash 162, the Rock Island 118, the St. Paul 94, the Missouri Pacific 21, other lines 22.

Coal Rates in Nebraska.

A press dispatch states at a meeting of the State Board of Transportation on July 25, the report of the Secretary as to the proposed freight rates on coal was adopted, and the roads doing business in Nebraska were ordered to adopt these rates within thirty days. The rates referred to are, we suppose, those named in a long report made in June on the complaint of Manning and Sutherland against the Chicago, St. Paul, Minneapolis & Omaha. The Secretary assumed \$3.75 to be a proper terminal charge for each car of coal, including the switching service at both ends of the route, and then, taking this in connection with the Inter-state rate on coal over the Burlington & Missouri River from Denver to Oxford, Neb., 300 miles, which he assumed to be just, he figured out the following:

Miles.	50.	100.	200.	300.	400.
Present distance tariff rate.....	\$1.40	\$2.10	\$3.20	\$4.20	\$6.20
Rates as proposed.....	.80	1.20	1.90	2.30	2.70
Per cent. of decrease.....	42	43	44	45	55

It does not appear whether the present actual rates in use by the roads generally are based on the distance tariff or not.

East-Bound Shipments.

The shipments of the east-bound freight from Chicago by all the lines for the week ending Saturday, July 27, amounted to 49,289 tons, against 47,436 tons during the preceding week, an increase of 1,853 tons, and against 39,052 tons during the corresponding week of 1888, an increase of 10,237 tons. This includes flour, grain, seeds, provisions, dressed beef, hides, wool, and lumber. The proportions carried by each road were:

	W'k to July 27.		W'k to July 20.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	5,111	10.4	4,798	10.1
Wabash.....	2,275	4.8	3,732	7.9
Lake Shore & Michigan South.	9,174	18.6	7,426	15.6
Pitts., Ft. Wayne & Chicago.....	6,217	12.6	6,689	12.8
Chicago, St. Louis & Pitts.....	4,771	9.7	6,247	13.2
Baltimore & Ohio.....	2,650	5.4	3,651	7.7
Chicago & Grand Trunk.....	11,625	23.6	8,480	17.9
New York, Chic. & St. Louis.....	3,587	7.3	3,405	7.2
Chicago & Atlantic.....	3,879	7.8	3,608	7.6
Total.....	49,289	100.0	47,436	100.0

Of the above shipments, 3,298 tons were flour, 12,184 tons grain, 3,130 tons millstuff, 5,724 tons cured meats, 1,855 tons lard, 9,100 tons dressed beef, 2,556 tons butter, 1,498 tons hides, 1,104 tons wool, and 6,116 tons lumber. The three Vanderbilt lines together carried 36.3 per cent., while the two Pennsylvania lines carried 22.3 per cent.